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IMPROVING STATION WIRING AND MINOR PIPING.

At this time of the year many central-station managers are making the most thorough examinations of their generating equipment and its auxiliaries in order to meet the anticipated loads of the fall and winter successfully and economically. During the warm season it takes a good deal of enthusiasm to go over a steam plant with a fine-toothed comb and to carry forward an energetic campaign of improvement in apparatus which at present has no difficulty in meeting the daily demands upon it; but there is no doubt that the company which makes the most of the next few weeks in rehabilitating its station will find that the effort pays when the days of heavy peak loads arrive. It is now getting pretty late in the season to attempt any very sweeping changes in station make-up with the hope of finishing them in time for the forthcoming winter business, although the present summer is much more favorable to prompt deliveries of equipment than many managers realize. A great deal can be done in the line of what might be called secondary improvements, however, and at a cost so moderate that it will make no appreciable difference in the net returns of most companies for the year.

In not a few plants there exists an excellent opportunity to improve the operating conditions by modifications in the wiring and minor piping. Particularly in the older stations is it true that the auxiliary piping is apt to get into condition unfavorable to the most reliable service, and often the wiring is more complicated and inaccessible than is actually required. It is tiresome for the station manager to be told year after year how important it is that his equipment shall be maintained at the highest possible pitch of efficiency; but the recurrence of shut-downs, fires, accidents, and more or less permanent lapses from economical power production, emphasize the necessity of a perpetual study of the conditions in each station. In the wiring field it cannot be too strongly urged that all conductors carrying high-tension current should be run out of the reach of casual passers-by, and it should be difficult under any circumstances to make contact with high-voltage busbars and cables. Not infrequently do owners of old stations look with disfavor upon the investment required to properly safeguard their busbars, leads and feeders inside the plant. There has perhaps never been any trouble; the force is cautious in working behind the switchboard and in the basement, and visitors are kept away from the danger points by the attendants. Space

need not be taken to emphasize the great risk of such a point of view. Where very high voltages are dealt with, the use of safe construction is so imperative that the danger here is really less than in stations operating at potentials of from 2,300 to 13,200 volts. Even if the routine work of the plant can be carried on with safety, the presence of unskilled labor or electrically untrained workmen introduces a hazard that may result in a very serious situation, through the running of steel drills into live conductors insufficiently protected, the cutting of lead cables by nails or hatchets, or the dropping of machine or other metal parts upon inadequately insulated horizontal conductors. In one station recently visited the generator leads were run across the top of a bare concrete floor to a conduit opening leading to the switchboard, the wires being covered with thin lead tubing. Every time the engineer of the plant walked across the room he was liable to step upon the lead tubing, or to drop some heavy metal piece or sharp tool upon it, thus running the chance of shutting down the street lighting and commercial service of the entire town, if indeed the station itself were not set afire by the short-circuit. This construction was adopted to avoid running wires across the station in sight, but it would have cost little to run a vitrified conduit through from the generators to the switchboard, and to separate the exciter leads from the 2,300-volt wiring, which was not done in the plant cited. The relocation of knife selector switches at a height above the tallest man's head costs little, in cases where they have been installed at too low a level for safety. The insulation of exposed high-tension busbars by oil-treated wooden clamps, or even by special tape, may be effective in time of need.

The improvements possible in auxiliary piping lie mainly in the direction of increased service reliability and operating convenience. Among the specific betterments which suggest themselves are the running of piping of small size at the sides of the engine room or beneath the floor instead of obstructing the working space of the plant with it, the addition of valves permitting the isolation of certain sections of feed pump steam lines, hot water services, and drains without the interruption of the balance of the plant; the removal of compressor tanks in oil engine installations from the middle of the room to the sides; the shortening of auxiliary steam line runs and the installation in some cases of auxiliary headers with sectionalizing valves; the attachment of lighter pipes to better resist vibration; and the separation of piping and wiring. Many fires have been caused in stations by the swinging of wires against gas or oil pipes, through the insecure location of each, even a 110-volt circuit being capable of making considerable trouble in this way. In one basement an unused metal water conductor was stored between the floor timbers in contact with the live terminals of an electric cut-out. The water pipe carried the current to a gas pipe, where a hole was melted and the escaping stream ignited. These incidents are by no means spectacular, but they are just as potent in causing damage or shutdowns of equipment as more impressive casualties. In another case a slight leak in the roof caused a loss of over $3,000 by a fire resulting from leakage of current, electrolytic action, corrosion and an open electric-light circuit, and in another instance a severe personal injury followed the contact of a grounded oil pipe with an opening switch blade. Rigorous inspection in advance of the fall load will eliminate many of these small but potent obstacles to the best quality of service.

THE NECAXA AND OTHER DAM FAILURES.

The astonishing rapidity with which the labors and expenditures of months, or even years, can be brought to naught by the failure of a dam has once more been emphasized. On the morning of May 20, 1909, approximately 715,000 cubic yards of the upstream portion of the great dam at Necaxa, Mexico, slid into the reservoir being constructed above it, in the space of one minute of time. The work of several years was undone in less time than it takes to state the fact.

Just about once each year a dam of more or less prominence will fail, causing losses of time, money and lives, to say nothing of engineering prestige. Why is this so? Do they fail through the same or different causes? Is there no remedy? Must we bow to the inevitable, and admit that any dam is liable to fail at any time? No, we think not. What, then? Let us examine a few recent examples and see what we shall see.

In 1906, a masonry dam at Durango, Mexico, failed from a very simple cause. This dam was of rubble concrete and was concrete faced, which would seem to indicate stability, and yet it "washed out" when overtopped by about one foot of water. In 1907, the dam across the Boardman River, at Traverse City, Mich., was carried away. This dam was also made of concrete, but it failed through scouring of the foundations, or "backwash." In 1908 a dam near Helena, Mont., failed for a seemingly simple reason. This was on the Missouri River, at Hauser Lake, and consisted of a steel frame covered with sheet steel and anchored in place. The middle portion of this dam was built on a gravel bottom and tied to sheet steel piling, which had been driven deep into the river bottom. This is where the dam failed, although investigation also showed that some of the concrete used had been laid in ten feet of water, with but little provision for proper setting. Several other instances of equal importance might be mentioned, but these are a fair assortment and will serve our purpose.

And now has come the failure of the Necaxa hydraulic-fill dam, a structure of gigantic proportions and highly approved type, due to the peculiar conditions with which the engineers had to contend. The peculiar kind of clay used for the core did not drain dry as rapidly as was expected, but remained as a pasty mass, so the great pressure created by the increasing height of the structure simply pushed out the upstream face, and the core "flowed out" after it. If the reservoir had been full of water this would probably have balanced the pressure, but the season has been unusually dry and

there was but little water impounded. And right here we get the first hint as to the causes of most failures of structures of this class. It is the "unusual" or the "unexpected" condition which occasionally arises that does the damage.

The dams mentioned were of different types, and every known form of dam has failed in at least one instance during the last quarter of a century, so the cause does not seem to lie in the type. Undoubtedly, the wrong type for certain specific conditions has been chosen in some instances and failure has resulted, but these have not been taken into account here. The remedy is too obvious. The great majority of dams do not fail, so we must assume that failures cannot be attributed in all cases to the ignorance of the engineering profession regarding "suitability." An examination of the explanations accepted as final in the cases of failure mentioned also shows a wide variety, there being probably not two failures from the same cause with any one type of dam.

Let us apply the same line of reasoning to structures of this kind that we apply to failures of engineering works of other kinds, and see where we come out. Take the failures of machinery, bridges and other metallic structures, for example, and we find that failure is due to one or more of four causes—bad material, poor workmanship, faulty design, or unfair treatment in service. The latter cause may fairly be omitted in considering our subject, for the service performed by a dam is not capable of variation to any great degree by the operator, and floods of unprecedented magnitude cannot be foreseen, although they might be assumed in laying out the design. But this does not come under the head of "unfair treatment in service."

Looking at the Necaxa failure from these three points of view, we find that, while the bad materials used for the core and for a portion of the upstream face were largely responsible, all three causes contributed to the result. First, as to the materials, the kind of clay used for the core of the dam did not drain dry so readily as other clays used for this purpose heretofore, and the stone (tepetate) used for a portion of the upstream face, where the failure occurred, was of very much less specific gravity than the sandstone originally intended to be used. Second, as to poor workmanship, it is admitted that the crest of the upstream toe was made narrower than that of the downstream toe, whereas it should have been wider, and that this was done to "save time" and material. It is also admitted that a poorly repaired break existed at this point, and might have contributed to the failure. And third, as to faulty design, there can be no question as to the excellence of the design in itself, but under this head we must of necessity include the engineering preliminaries and the supervision of the structure because of its nature. In any undertaking of this kind changes are nearly always found necessary as the work advances, and the engineer is called upon to modify his design as a sort of a "continuous performance." The engineer allowed materials to be used "against his better judgment" in order to save time and apparently did not conduct any very extensive tests to determine the draining qualities of the clay. There were other changes, also.

It might be contended that the engineers could have prevented this failure by doing differently. Possibly, and in other cases also, but there was no precedent to guide them in this case, in many details, and their judgment, even though based upon years of the broadest experience, did not quite equal the requirements. They have been very frank in discussing this affair and have taken all of the blame that can justly be placed upon them, and they are notable exceptions to the rule of "pass it on." Engineers as a class are very careful and take as many factors into account as they can in reaching their conclusions, but they have their limitations, like other human beings, and sometimes fail.

So, while we do not yet know the magic "cure all" for dam failures, or any other kind, we can at least learn the lesson of "Don't do it again." It has been truly said that "the scrap pile is the place to learn," and from the wrecks of dams engineers may learn what to avoid in future works. We believe they will.

ELECTRICAL EXPORTS.

On another page of this issue are given in convenient tabular form statistics on electrical exports from the United States for the last three fiscal years, ending on June 30 in each case, and for the thirteen months preceding July 1 of this year. These tables form an interesting basis for study of the conditions prevailing in the electrical industry. The totals for the three years referred to are as follows: 1906-1907, $17,268,406; 1907-1908, $15,249,436; 1908-1909, $12,524,391. Thus for the last year there has been a slump of $4,744,015 from the banner year, 1906-1907, just preceding the financial panic. This undoubtedly represents the lowest point in the prevailing depression. The monthly figures for the close of the last fiscal year show a fairly general improvement. Now that the tariff situation has been cleared up, there should be a steady upward trend in the electrical industry in keeping with the improved business conditions all round. The fiscal year 1909-1910 should therefore be able to show a decided recovery in electrical exports to the excellent totals of a few years ago.

BOOK REVIEWS.

There is an old phrase which we all learned when we were at school to the effect that "a man is known by the books he reads." In technical literature, as in all other divisions of letters, there are books good and bad, and reviewers ofttimes fall short of grace in commenting upon new books as they appear. There is a demand for books in the electrical field and the publishers have been at work to supply this demand. On other pages of this issue we review a number of the latest offerings—all good books—and to those who are interested in the present state of the art these will be found of interest and profit.

DETAILS OF WATT-HOUR METER MANUFACTURE.—I.

BY JOSEPH B. BAKER.

GENERAL REMARKS.

The following account was written mainly from notes of inspections of the General Electric Company's meter factory at Lynn, Mass., several years ago, and of the Westinghouse Electric and Manufacturing Company's meter factory at Newark, N. J., more recently. The bulk of the matter on damping magnets, and the notes on sapphire cup jewels, pivots and pivot-jewel step bearings, were obtained at Lynn; and the matter on the cup-sapphire ball jewel, and on the other meter parts referred to, at Newark. There have also been incorporated some data from the trade publications of several meter-manufacturing companies.

A visit to the meter factory of one of the large manufacturing companies impresses one with the enormous amount of care and skill exercised in all details of the making and testing of the electric meter. The emulation of scientific achievement, and commercial competition have resulted in marked improvements in meter design in recent years, and the work of the designers is ably complemented by that of the factory staff.

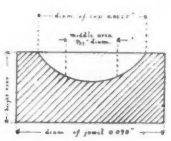


FIG. 1.—GENERAL DIMENSIONS AND SHAPE OF SAPPHIRE JEWEL. DIAMETER OF CUP, 0.0625 INCH; HEIGHT OF JEWEL, 0.04 INCH; DIAMETER OF JEWEL, 0.090 INCH.

One of the most noteworthy things is the system of inspection that permeates the entire process of manufacture from the selection of the raw materials to the final checking of the finished meters. The care that is taken in this inspection at every stage is due to the realization of the fact that every meter sold is a representative of the company that made it, and that its good or bad performance in service adds to or detracts from the reputation of the company.

Another thing is the extent to which modern factory systems have been adopted. The meter factory is in the front rank in the providing of plenty of light, by ample skylights and large windows, and by lavish distribution of the electric light; in the attention paid to such matters as good ventilation, cleanliness, maintenance of tools, systems of cost keeping and of progression of manufactured parts through the different departments of the factory, and discipline of the working force; in the use of individual and group electric-motor drive for the tools, and in many other practices of recognized value.

The meter factory may be equipped with a generating plant of its own (preferably in duplicate), consisting of direct-current and alternating-current motor-generator sets for giving the voltages and currents required to test the factory's production of meters. The alternating-current machinery may include a motor-generator with variable speed or variable number of generator poles, or both, to give different frequencies—for example, frequencies ranging from twenty-five to 133 cycles—to facilitate the testing of meters designed for operation on special frequencies, as in the case of some meters for foreign service, as well as the regular product.

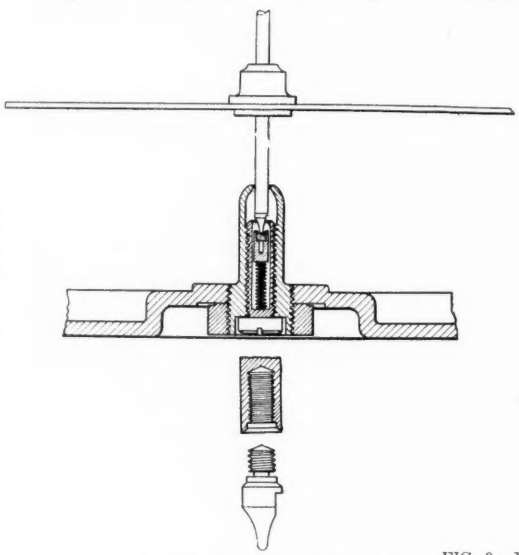


FIG. 2.—PARTIAL VERTICAL SECTION OF METER BASE.

BEARINGS.

As already demonstrated elsewhere, the successful performance of an electric meter requires that the ratio of torque to mechanical friction shall be not only large, but as nearly constant as possible. Step and top bearings, register, and windage of the rotating element, and, in direct-current meters, the contacts between commutator and brushes, are all sources of mechanical friction.

STEP BEARINGS.

The step bearing, on which rests the entire weight of the rotating element, is the seat of a large percentage of the normal mechanical friction of the meter, and of the troubles that may develop in service. In general, the excellence of the design of construction of the lower bearing and the actual weight of the rotating element determines largely a meter's ability to maintain its initial accuracy under service conditions; for it is at the lower bearing that wear first asserts itself, and any wear at this point eventually introduces friction, with consequent inaccuracy, especially at the light loads. The severe requirements thus imposed—that the friction at the step bearing shall be reduced to the smallest possible amount, and that this minimum shall not increase with time—have led to the expenditure of a great deal of pains to develop this detail of the meter.

Experience with step bearings for commercial electric meters has proved that for the bearing surface but two substances will give continuously satisfactory operation as jewels—the sapphire and the diamond.

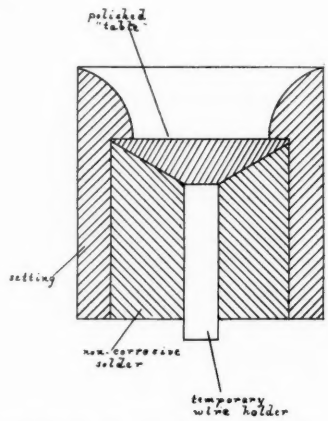


FIG. 3.—VERTICAL SECTION, SHOWING POSITION OF DIAMOND END-STONE AND ITS SETTING.

There are two main types of jewel bearings: the pivot-jewel bearing, exemplified in the T R W meters, and the ball-jewel bearing, employed by the Westinghouse Electric and Manufacturing Company.

Pivot Jewels.—Until within recent years, the sapphire cup jewel was used for most meters. Fig. 1, a drawing of a sapphire jewel that has been used for T R W meters, gives an idea of the general dimensions and shape of this form of jewel. See also Fig. 2, a partial vertical section of a T R W meter base, which shows the jewel mounted in the jewel screw.

In the T R W meter the cup or ring-stone jewel is inserted in the end of the jewel screw, where it rests on top of a steel-wire, open-coil spiral spring. The open end of the screw is then spun over the jewel mounting, which is thus securely confined between the end of the screw and the spring. The latter serves to protect the jewel from the possibility of injurious effect of blows or vibration through which the meter is liable to be subjected in service. The strength of the spring is so proportioned as to "float" the rotating system, the spring being under a slight compression. The total possible movement of the jewel, against the tension of the spring, is about one-eighth inch. Extensive experiments have determined that the life of the (sapphire) jewel depends upon the adaptation of the stiffness and natural period of the jewel spring to the weight of the moving element. Since the latter varies in the different types of meters, jewel screws having springs of different strengths and periods are provided. In the latest type of meter, the jewel screw is combined with a shipping clamp (sometimes termed "locking device"), not shown in Fig. 2, by means of which the rotating element is automatically locked, out of contact with the jewel, in transportation. The spring support of a meter jewel, in a meter having a fairly heavy rotating element, greatly prolongs the life, by protecting it from the effects of the severe reciprocating or pounding motion caused by local vibration or by the action of the alternating current in alternating-current meters.

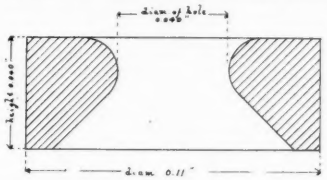


FIG. 4.—JEWEL HOLE.

Without the spring support, ordinary vibration would be liable to break the polished surface of a cup sapphire jewel and lead to serious breakdown of the meter's accuracy long before the jewel could be affected by ordinary wear.

For large meters, having very heavy rotating elements, or for meters subject to considerable vibration, a spring-supported ring-stone jewel, consisting of a flat diamond end-stone with sapphire jewel-hole, has been used. Figs. 3, 4 and 5 are vertical sections showing, respectively, a diamond end-stone and its setting, the general shape and dimensions of a sapphire jewel-hole, with bearing surface ground and polished, and a ring-stone jewel assembled.

It may be stated that commutator meter step bearings having a steel pivot or shaft-end should be spring-mounted, and should be equipped with a shipping clamp for holding the rotating system out of contact with the jewel when the meter is being moved. The need of these devices, and the importance of not moving the meter without setting its clamp, are greater in proportion to the weight of the rotating element, and therefore greater in commutator meters, with their comparatively heavy moving system, comprising a long shaft, and the armature and commutator.

The method of mounting the diamond end-stone in its supporting plugs is to back it with solder. A short piece of tinned phosphor-bronze wire serves to hold the "table" of the diamond (the bearing surface) against the upper or open end of the plug, using a special pair of pliers. A non-corrosive solder is then sweated into the space between the wire core and the inside wall of the plug, thereby holding the stone securely in place. It is necessary to use a non-corrosive solder to prevent creeping of corrosive substance to the table of the diamond and loosening up of the stone in its setting. The bit of phosphor-bronze wire may then be withdrawn, leaving the end-stone setting as shown in Fig. 5.

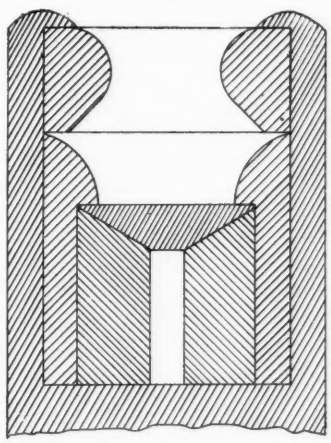


FIG. 5.—END-STONE SETTING.

A method of grinding and polishing diamonds in a concave form has been developed, by means of which a surface is secured that is claimed to be unsurpassed even by jewels having a flat face. Cup diamond bearings were used at first only in meters having heavy moving elements or which were subject to considerable vibration; but this form of jewel may ultimately replace the cup sapphire in meters of ordinary capacity already installed.

The accuracy of a meter equipped with a flat diamond jewel is liable to be erratic at loads under seven-and-one-half per cent of full load, owing to variable friction between the side of the pivot and the sapphire ring-stone. On the other hand, the longer life of the diamond jewel makes it superior to the sapphire cup jewel for use in electric-car meters, which are exposed to very heavy and continuous vibration.

In regard to the life of the diamond jewel compared to that of a sapphire jewel: The life of a jewel is rather an indefinite quantity, depending upon the type and quality of the jewel itself, the weight of the moving element and the amount of vibration to which the meter is subjected at its place of installation. It is generally expressed as the number of rotations made by the meter before the light-load accuracy is affected ten per cent. When the meter is operated under normal conditions, the life of a sapphire jewel in a commutator meter should exceed 600,000 rotations, and will probably average, for a T R W meter, 1,000,000 rotations. On the other hand, cases have been reported of flat diamond jewels running 40,000,000 rotations, in a T R W meter, without any signs of wear. Any jewel in an induction meter will operate longer than the same jewel in a commutator meter, on account of the lighter rotating element of the former.

Severe and prolonged service tests are being conducted by the large central-station companies on meter jewels of all sorts—cup sapphires with pivot and ball bearings, and flat and cup diamonds—to determine their relative "life."

FIG. 6.—JEWEL POLISHER AT WORK.

The making of jewels is one of the most important branches of the manufacture of electric meters. As an industry, it is a definite branch of the ancient art of the lapidary, which is followed in certain families from father to son for generations; but under the modern conditions of electric meter and instrument manufacture, piecework and division of labor have been applied.

In the making of sapphire jewels, to insure a satisfactory bearing, it is necessary that every stone be selected, ground, polished, and tested with the utmost care. Only the finest quality of "Eastern Sapphires" is used, the percentage of rejections from each lot of stones purchased averaging high. The best stones for meter and instrument jewels are the light bluish white; the yellow or the dark-col-

ored stones being too soft as a rule for use under the rigid requirements of the work.

The first step in the handling of sapphires for jewels, after the rejection of soft or flawy stones, is the cutting of the stones into slices, of thickness suitable for making jewels. This cutting is done by the use of circular copper-leaf saws "charged" on the edge with bort or diamond dust and rotated at high speed. The rough stones, securely mounted on brass holders by the use of melted shellac, are fed against the saws, which are arranged in gangs, the number of saws on each spindle depending upon the size of the stone to be cut. In this work, as in all subsequent rough work on the jewel, a running stream of water—made soapy in some cases—is used to keep the copper tool from heating. The cutting proceeds rapidly, and each stone is transformed in a few minutes into a pile of slices of sapphires.

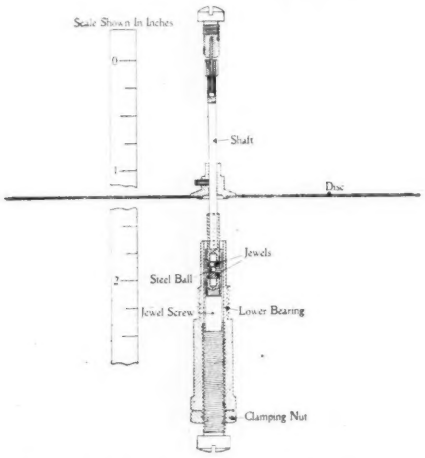


FIG. 7.—BALL-AND-JEWEL BEARING OF WESTINGHOUSE INDUCTION METER.

The next step is the rough grinding, using a revolving copper disk charged on its upper face with the diamond dust, which brings down the thickness of the slices to a nearer approximation to the final thickness of the jewels. The fine grinding is effected by the same process, but using a finer grade of bort on another disk.

The stones must now be "chipped" and turned. The chipping is done by hand, each stone being held securely upon a steel plate and its edges chipped off by the use of a sort of chisel, so as to give a (roughly) circular disk, of minimum diameter a little greater than that of the finished jewel.

After chipping, examination is made by a jeweler's magnifying glass for freedom from flaws, disks containing flaws being rejected at this point, so that polishing labor may not be wasted upon them. In order to pass this inspection, disks must have sufficient perfect stone in the center to permit the grinding of a cup of uniform high polish over its entire surface. The rough disks, mounted by shellac upon the end of a brass arbor which is carried in a small lathe chuck, are then turned down to final diameter —the turning of the edge of the jewel being really a grinding process, using coarse bort applied by a copper tool.

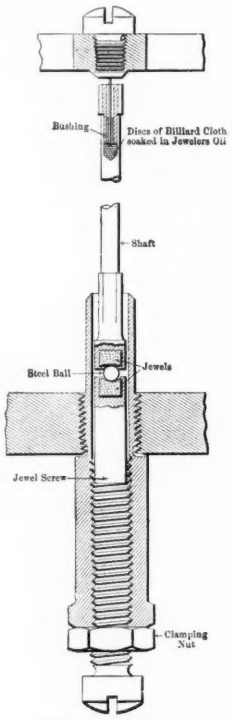


FIG. 8.—UPPER AND LOWER BEARING OF SHAFT.

When the required diameter is reached the stones go to the polishers, each of whom has his own traditional method of work. In making "cup jewels," the cup, or actual bearing surfaces in the meter, is started with a diamond point held at the end of a copper tool. In the minute depression thus made, the polisher works with a sharpened boxwood spindle dipped in bort, the spindle, connected to a flexible shaft, being driven at about 1,800 revolutions per minute in reverse direction to the rotation of the shaft (see Fig. 6). It is upon the quality of this work that the excellence of a meter largely depends, in its ability to stand up in service for a considerable time without showing increasing friction, or actual deterioration of the jewel or pivot. In the polishing of cup jewels and jewel-holes, each workman carries the process through to a finish on the lot of stones turned over to him, from the rough-faced turned disks to the jewel in its final condition, with a top trued with the cup or hole, as the case may be, and with the bearing surfaces of as high a polish and of as perfect a figure as the best grade of the material permits.

Following the polishing of the cups of cup jewels, and the narrow ring surfaces of the jewel-holes, used in ring-stone jewels, the product is tested for flaws.

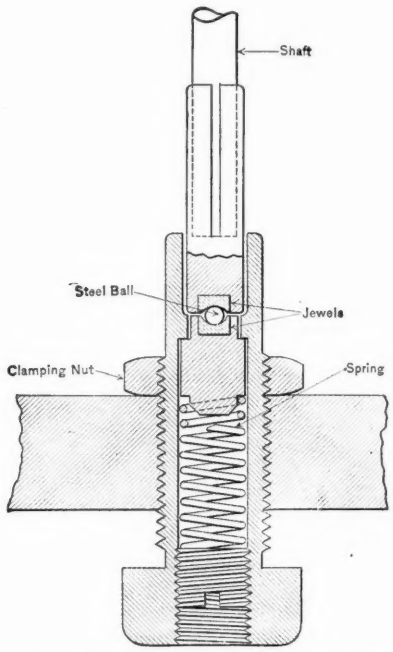


FIG. 9.—SECTION SHOWING DETAIL OF BALL BEARING.

The jewels are first examined carefully with a jeweler's magnifying glass. Next comes the "needle inspection," in which the workman examines each stone with a polished steel needle-point fixed to a handle, moving the needle about in the surface of the jewel so as to detect by the sense of touch any imperfections, either in the work of the polisher or in the stone itself, that might escape visual examination with the glass.

Cup-diamond jewels have been subjected to the following further test, in addition to those already described, to detect any irregularity or "waviness" in the bearing surface that could not be detected by ordinary visual inspection or by the needle test:

The inspector's apparatus is an optical one, consisting of a pair of thin straight metal rods, parallel to each other

and a short distance apart, supported at a convenient height above his bench and well illuminated by hooded incandescent lamps. The jewel, laid on the bench in a horizontal position, gives in its cupped surface a reflected image of the rods, which he examines closely through a jeweler's glass. The image of the rods, in a jewel having perfect figure—*i. e.*, the cup surface of which is a true surface of revolution—will show as a pair of parallel curved lines, without break or jog, from one side of the jewel to the other; and as the inspector turns the jewel about between his fingers, through a complete revolution, this symmetrical image will remain unchanged. If, however, there be any irregularity in the surface of the cup, it will show up to the inspector's eye as the jewel is turned.

By the use of this apparatus an inspector can sort out imperfect cup diamond jewels very accurately and rapidly. It might be an improvement to hold the jewel in a clutch on the end of a vertical arbor, to facilitate turning smoothly.

Pivots.—In order to realize the antifriction properties of a jewel used as the step bearing of a meter, the top of the shaft which turns upon it, forming the upper member of the step bearing, must be equally as well adapted to its purpose as the jewel upon which it turns.

In most modern meters a removable shaft-end, or "pivot," which may be renewed, when worn or damaged, without having to replace the entire shaft, is used. Such a pivot and its mounting are shown in the section of a T R W meter base, Fig. 2. These pivots are made of the best quality of steel piano wire, 0.034 inch in diameter, drawn under heavy pressure to obtain the finest possible grain. The wire is cut into proper lengths, and the pieces are annealed by roasting them at a red heat, in charcoal, for about half an hour, allowing them to cool naturally. Each piece is next firmly secured in a brass "blank," by forcing it into a hole in the tip of the blank a trifle smaller in diameter. The steel and its holder are then ground to shape, as one solid piece, and the bearing point is finished to proper smoothness by a fine oilstone, followed by Vienna lime, to give it a high polish.

The complete pivot is attached to the end of the shaft by a screw thread, as shown in Fig. 2, using a special pivot wrench, which is furnished with the meter by the maker.

Although the pivots are glass-hardened and highly polished, after they have been operating for any length of time upon a rough or broken jewel this polished surface is broken and sometimes becomes charged with small particles of the stone, which cause the pivot to become a cutting tool. For this reason a new pivot should always be inserted when the jewel is replaced.

Ball-and-Jewel Bearings.—The ball-and-jewel bearing of Westinghouse induction meters is shown in section in Figs. 7 and 8. It consists of a hardened, highly polished steel ball enclosed between a pair of sapphire cup-jewels—an upper jewel held on the bottom of the meter shaft and a lower jewel supported on the meter shield—having a radius of curvature of bearing surface slightly greater than the radius of the ball.

The upper and lower jewels and the jewel mountings are identical, but their arrangement in the bottom of the meter shaft and in the fixed bottom support secured to the shield is different. The upper jewel mounting—hereafter termed simply "the jewel"—is held in a sleeve, which is split to make a good friction fit on the bottom of the shaft, and is retained in the sleeve by an open cap, screwed on over the jewel. The lower jewel is held in the long jewel post by a screw cap also. After the cap is screwed on to retain the jewel, it is pinched by a special pricking tool, which indents the thin shell of the cap and locks it to the sleeve or post.

This method of holding the jewel mounting is claimed to be better than the method by spinning over the end of the jewel post, as employed in some makes of meters that are equipped with a steel pivot or shaft end; as the latter method is liable to get metal dust on the jewel, or to injure the jewel by accidental contact with the tool, etc. It is claimed that when once the jewel is in place in its mounting, no more tool work should be done on or near the latter.

The steel balls used in the form of jewel bearing, one-sixteenth inch in diameter, are said to be imported from abroad. They are additionally polished at the meter factory, and subjected to a rigid inspection, including examination under the microscope. In handling them, a pair of wood tweezers is employed exclusively to avoid the possibility of marring the ball, or depositing dust or other foreign particles upon it. The inside diameter of the sleeve is less than one-sixteenth inch greater than the outside diameter of the upper and lower jewel mountings, so that the ball cannot by any chance slip out of the bearing in any position of the meter.

In assembling the jewels in the meter, the lower jewel post is screwed into the shield and locked in place by a locknut at the desired height, governed by the "play" in the shaft, which is made one-thirty-second inch. The position of the disk is adjusted (to run, in an induction meter, in the middle of the 0.125-inch air-gap between shunt and series fields) by moving the disk up and down on the shaft, and securing it with the set screw that is tapped into its hub (see Fig. 7).

It will be noted that for the Westinghouse induction meter the jewel step bearing is not spring-mounted, and it is claimed that no spring support is necessary on account of the light weight of the rotating element in the type B or C house-service meter. In the Westinghouse commutator meter, however, on account of the much greater weight of the rotating element, a spring support is provided for the lower jewel, as shown in Fig. 9.

Among the advantages claimed for the ball-and-jewel bearing are:

The ball does not remain stationary relatively to either of the cup jewels that enclose it, because, to begin with, it cannot be perfectly centered, since there must be some departure from strict alinement in drilling the bearing holes in the meter shield. Again, in induction meters, it is thrown out of exact alinement by the "pounding" or vibration of the rotating element, due to the alternating current, and by unbalanced lateral stresses from the resultant fields of the meter. Other causes of unbalanced stress on the ball are variation in jewels, lack of perfect leveling of the meter or getting out of level after installation, and unbalanced pull of the damping magnets on the disk. Any one of these causes would operate to turn, or roll, the ball; and it would seem more difficult to prove that the ball does not roll in its seat between the jewels, than that it does roll. It is claimed by the makers that jewels taken apart after a long period of service will show an increased polish all over the surfaces of the ball and jewels. Friction is divided between the upper and lower surfaces of the ball, so that although the pressure upon the jewel is undiminished, the amount of wear upon the jewel is divided, and at the same time the wear upon the ball is evenly distributed over the entire surface of the ball, as it rolls.

[To be continued.]

LOSSES, INDUCED VOLTS, AND AMPERES IN ARMOR AND LEAD COVER OF CABLES.[1]

BY H. W. FISHER.

PART II.

This part deals with tests made on 100 feet of steel-taped armored cable of the following construction: Size of conductor, No. 0, Brown & Sharpe gauge; thickness of paper, eight-thirty-seconds inch; thickness of lead, one-eighth inch; diameter over lead, one-and-one-eighth inches; diameter over armor, one-and-five-eighths inches; dimensions of steel tape, 0.039 inch by one-and-one-half inches (two of such tapes were applied in same direction, overlapping each other); resistance of conductor, 0.0103 ohm; resistance of lead sheath, 0.0300 ohm; resistance of armor, 0.150 ohm.

steel armor, which forms an almost closed magnetic circuit, the curves for this cable are radically different from those of the steel-wire armored cables.

On referring to Fig. 4, which gives the impedance per 2,000 feet at sixty cycles, it will be seen that the impedances are greatest when the armor and lead are not connected, and that a sharply defined maximum is reached with a conductor current of about eighty amperes. There is not much difference in curves A_6 and C_6 except at low current densities, where the greater distance between cables of test C_6 makes the air effect larger proportionally.

Short-circuiting the armor at each end of the cable (see A_8 and C_8) decreases the impedance only slightly. However, when both lead and armor are short-circuited (see A_9 and C_9), the impedance is very much reduced, and only very slightly with

resistance per 2,000 feet of circuit may be less when the lead and armor are not connected than when they are connected. The maximum equivalent resistance is about eight times the ohmic resistance when the lead and armor are disconnected. Under practical conditions of operation, the equivalent resistance would be about three-and-one-half times the ohmic resistance.

All this tends to show how advisable it is to use multiple-conductor cables all under one armor instead of single-conductor armored cables. The equivalent resistances given in Fig. 5 were found by means of wattmeter tests.

Fig. 6 gives the volts induced per 100 amperes in 2,000 feet of circuit. These curves very clearly show a maximum rate of induced voltage that corresponds to about eighty amperes in the conductor. As would be expected, the induced voltage

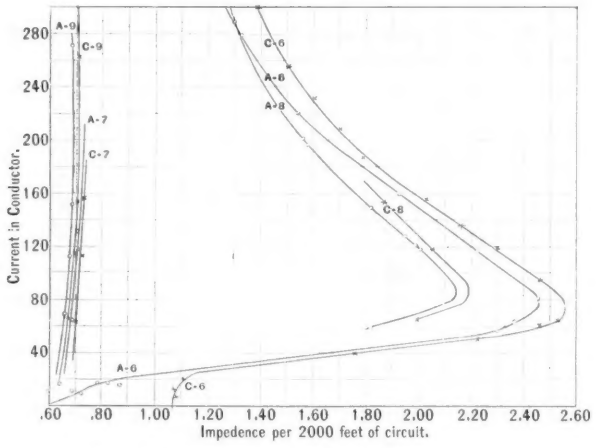


FIG. 4.—IMPEDANCE AND CURRENT CURVES.

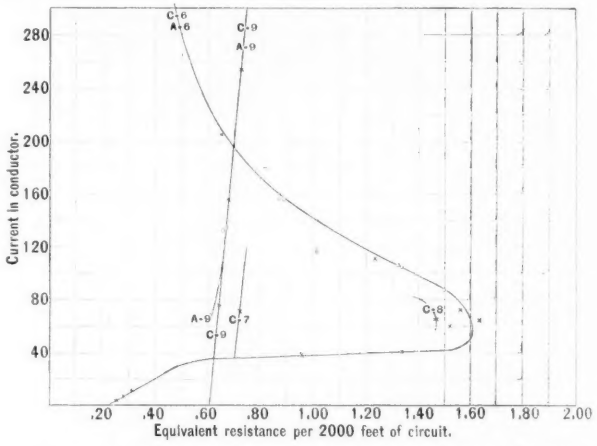


FIG. 5.—EQUIVALENT RESISTANCE PER 2,000 FEET OF CIRCUIT.

To designate the different curves, the following letters and figures were employed:

A indicates that the cables were one-and-seven-eighths inches between centers.
C indicates that the cables were twenty-four inches between centers.
1 indicates induced current or volts in lead.
2 indicates induced current or volts in lead, the armor being short-circuited at each end of the cable.
3 indicates induced current or volts in armor.
4 indicates induced current or volts in armor, the lead being short-circuited at each end of the cable.
5 indicates induced current in armor and lead connected in parallel.
6 indicates lead or armor of each cable not connected or interconnected.
7 indicates lead short-circuited at each end of the cable, armor free.
8 indicates armor short-circuited at each end of the cable, lead free.
9 indicates lead and armor short-circuited at each end of the cable.

On account of the continuity of the

the amount of current flowing in the conductor. In this kind of cable, when the lead and armor are disconnected, the impedance may be fifteen times the ohmic resistance. When the lead and armor are short-circuited, as is generally the case in practice, the impedance may be about three-and-one-half times the ohmic resistance.

Fig. 5 gives the equivalent resistance per 2,000 feet of circuit. Here a current of about sixty amperes in the conductor seems to produce the maximum resistance. It is interesting to note that this resistance seems to be practically independent of the distance between the centers of the cables. It is also a striking fact that curves C_6 and A_6 cross curves C_9 and A_9 at points corresponding to about forty and 200 amperes, respectively, so that for small current densities and very large current densities the equivalent

is greatest when the cables were furthest apart, and at the maximum point the volts per 100 amperes amounts to about 240, or actually about 190 volts. With a load of 170 amperes, the induced volts would be about 290. When the lead is short-circuited, the electromotive-force on the armor, as given by C_4, is very small. The intermediate curves are in the order that one would expect.

The significant fact brought out by these tests is that it is absolutely necessary to bond the armor and lead of single-conductor cables like the above or else arcs may occur between the cables, or alternating-current electrolysis may tend to destroy the armor or lead. Even when such cables are laid in water, it would be best to bond the armor and lead occasionally.

Fig. 7 gives the induced current per ampere in conductor, and with high cur-

[1] Abstract of a paper presented before the annual convention of the American Institute of Electrical Engineers, Frontenac, N. Y., June 29, 1909.

rent densities the induced current amounts to nearly eighty-five per cent of the total current. On account of the high resistance of the armor, the current introduced therein is small (see A_3, C_3 and C_4). The other curves are practically very close together, and the greatest current is obtained when the cables are operating under practical working conditions with the lead and armor connected.

The large amount of induced current will not only increase the losses under operation conditions of such a cable, but will also, of course, tend to reduce the safe carrying capacity. Therefore, as previously stated, when armored cables have to be employed for alternating currents, all circuits should be placed in one cable. When it is impossible to do this, the cables must be operated at an induced loss.

A comparison between measured and calculated data is found in Table 5. This will be of interest as an illustration of the accuracy of the practical method given at the close of the paper.

In Table 5, the impedances and effective resistances are for lead covers short-circuited at each end of the cable. The values given in Table 5 are per 2,000 feet of circuit. Only one test was made of effective resistance, and that with seventy amperes flowing in the conductor.

TABLE NO. 5.

Current in Conductor.	Impedance. Measured.	Impedance. Calculated.	Volts Induced on Lead. Measured.	Volts Induced on Lead. Calculated.
300	.73	.716	128	126
156	.72	.73	187	187
70	...	...	...	...

Current in Conductor.	Effective Resistance. Measured.	Effective Resistance. Calculated.	Induced Current in Lead in Per Cent of Conductor Current. Measured.	Induced Current in Lead in Per Cent of Conductor Current. Calculated.
300	...	.68	.815	.83
156	...	.716	.80	.87
70	.72	....	...	...

In order to see if the correction method would give a closer agreement to the measured impedance than the method which is correct for cables without iron armor, the following calculations were made with reference to the steel-wire armored cable mentioned in Part I. The distance between centers of cables was one-and-one-half inches.

Measured impedance equals 0.233; calculated impedance by correction method equals 0.226; calculated impedance by theoretical method for cables without armor, equals 0.283; current in conductor, equals 140 amperes.

The close agreement of the first and second impedances given shows that the correction method should be used in connection with armored cables.

Comparison calculations between the two methods as applied to the steel-tape armored cable showed a fairly close agreement. This, no doubt, is due to the fact that the reactance of this cable is so great that the current induced in the lead is a large percentage of the conductor current and a large change in the reactance will only slightly affect the lead current.

The closing part of this paper, prepared by R. W. Atkinson, gives the methods for making calculations in reference to armored cables.

[To be continued.]

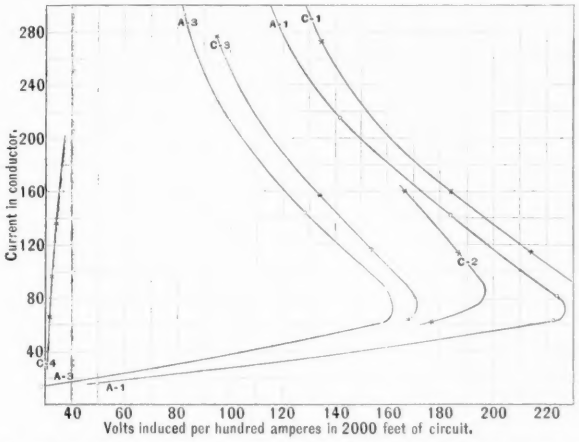


FIG. 6. RELATION OF INDUCED VOLTS AND CURRENT IN CONDUCTOR.

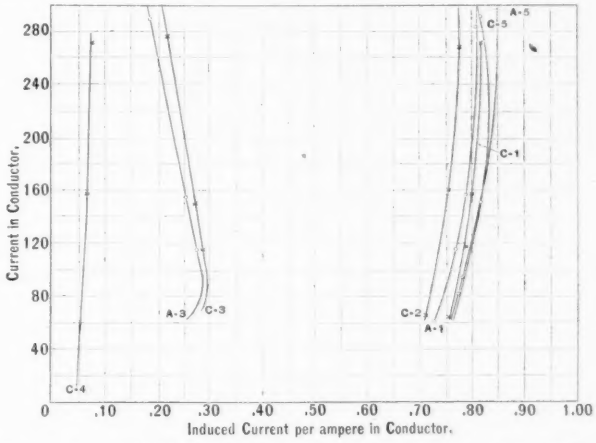


FIG. 7.—INDUCED CURRENT PER AMPERE IN CONDUCTOR.

International Harvester Company Installs Individual Electric Drive.

Starting with next week the entire machine shop of the Keystone works of the International Harvester Company, at Sterling, Ill., is to be electrified. Turbines are now being installed for developing the electric power which is to be transmitted all over the shops to individual motors at the machines. An estimated saving of one-half in power cost is expected.

Street-Railway Supervision.

Supervision of street railways in England and Prussia has been made the subject of inquiry by the New York Public Service Commission of the First District. It finds that in both of these countries prevention rather than correction of abuses is the policy which is successfully followed in the supervision of these enterprises.

Supervision is a state rather than a municipal function, and the state authorities in granting consent to construct street-railway lines set out in detail the conditions under which the franchise can be exercised. In Prussia both the state and the municipality grant franchises. Before the new line is opened a thorough inspection is made, the plans of construction are subject to searching inquiry and every effort is taken to protect public and private interests and to secure the safety and convenience of the public.

The report says further: "This system of regulation has existed from the start. The state did not wait to see if perhaps supervision might be unnecessary. The street railway was a public utility; it was licensed to perform a service of paramount public importance. This was deemed a sufficient reason for taking adequate precautions to safeguard the interests of the public.

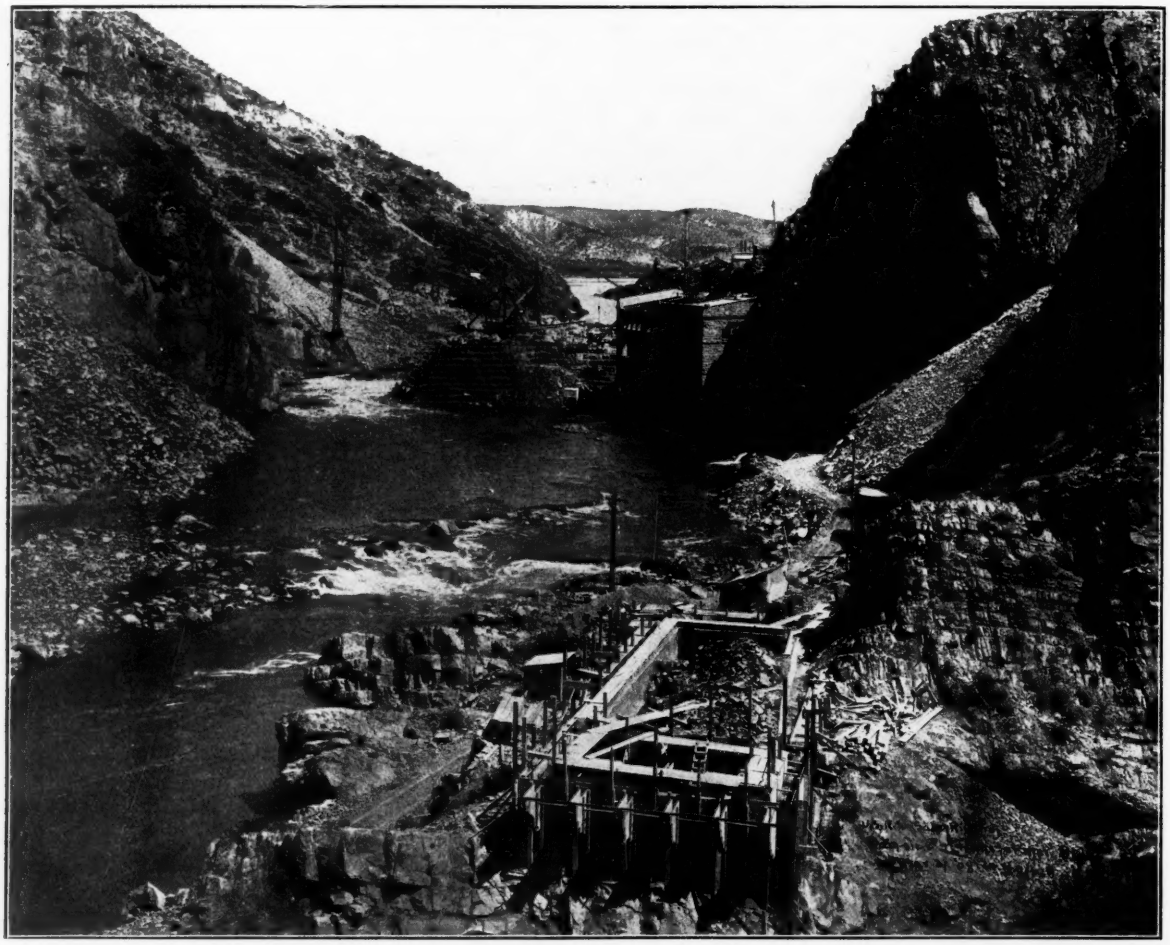
"As a result, abuses which are quite common in America scarcely exist at all and the supervising authorities are rarely called upon to exercise their corrective functions. It is true, however, that in general the Prussian and English supervising authorities do not employ inspectors to see that their regulations are enforced but rely almost entirely on complaints from individuals or municipal authorities."

WORK ON THE ROOSEVELT IRRIGATION PROJECT IN ARIZONA.

ELECTRICITY AS AN ADJUNCT IN DEVELOPMENT AND CONSTRUCTION.

BY D. A. WILLEY.

The use of electric power in connection with irrigation projects has been demonstrated in a remarkable way in what is known as the Roosevelt Dam in Arizona. Several articles have appeared recently,[1] and the data herewith are presented in the nature of supplementing that already given and adding several illustrations which have just come to hand, indicating the extent and picturesque features of this work. It may be said that without the present development of current for power purposes, many of the schemes which are now being undertaken by the United States government to reclaim the arid lands in the West by the formation of artificial water supplies would be impossible. In some places it is necessary to lift the water from one level to another by means of powerful pumps actuated by electricity. In fact, irrigation through the medium of the electric pump is one of the most important phases of this development in the West as is shown by the success of what might be called electric irrigation in Kansas as well as in the Salt River valley in Arizona, where it forms an adjunct of the principal irrigation scheme.



VIEW OF THE DAM AT ROOSEVELT, SHOWING ONE OF THE CONCRETE BUILDINGS UNDER CONSTRUCTION.

A special feature of the engineering methods at Roosevelt, however, is the many ways in which the electric current is utilized not merely for lighting and for communication, but for furnishing power. The fact is, that the Salt River, which will furnish the bulk of the water for the main reservoir being formed, has played an important part in constructing the enormous dam as well as other works at this point by the system which has been adopted by the engineers. One of the first steps taken was to locate a route for a power canal as the head of water which could be obtained was such that the engineers calculated it would furnish ample energy for building operations at a very small expense as compared with steam, owing to the long distance which fuel would have to be carried and the large outlay which must be incurred to obtain an adequate plant of engines and boilers and to transport them the long distance over the country from the nearest railroad station.

The power canal can be well termed one of the most interesting features of the entire project. Waterpower or electric current has before been secured from dams intended for irrigating purposes by utilizing the waste water. Such power, however, is only available when the flow of water into a reservoir is more than sufficient to fill it. The power at Roosevelt is obtained independently of the irrigating scheme, the canal being separate from the reservoir and one of the first

[1] Vol. 52, No. 9, pp. 316. Vol. 55, No. 1, pp. 10.

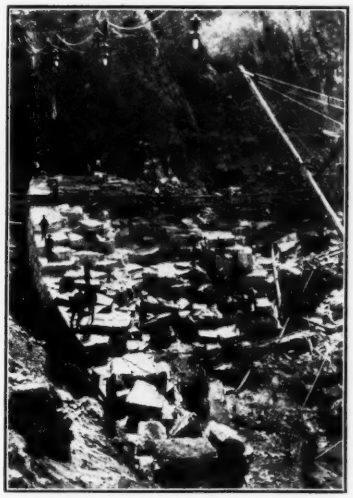
works completed. The head of water secured by means of the canal actuates waterwheels connected to electric generators. From the power station extends a transmission line conveying current to the plant for the manufacture of cement, the stone-crushing plant, for lighting, operating the aerial railway, and for other purposes. Under a head of 250 feet, hydraulic jets with nozzles of eleven inches have been used to wash away the loose formation and accumulation of sump above the bedrock upon which the dam proper is being built, and have greatly facilitated progress. Much of the gravel thus secured has been utilized for construction material. To remove the gravel, elevators have been placed in service.

THE ELECTRICALLY DRIVEN PUMPS SUPPLY THESE IRRIGATING DITCHES.

ONE OF THE SUPPLY CANALS SERVED BY THE ELECTRICALLY DRIVEN PUMPS.

This canal, which is twenty miles in length, is one of the permanent works. Most of it is lined with concrete, and it includes several extensive tunnels, aggregating nearly 10,000 feet in length. It is carried over gulches by concrete pipes. The dams used for diverting the water to the power canal represent a cost of $40,000, while the canal, including its pressure pipe and auxiliary structures, represents a total of nearly $1,000,000. With all of the generating sets to be installed in service, it will develop no less than 4,400 horsepower, which will be used for pumping water for irrigation.

With this supply of power a comparatively small amount of hand labor has been needed on the Roosevelt work, enormous as it is. In fact, it is doubtful if as much material is handled anywhere in the world with the same number of men and placed in position as upon this great Arizona improvement. The dimensions of the dam will give an idea of the magnitude of the reservoir. It will form a storage basin holding sufficient water to flood 1,300,000 acres to an average depth of one foot. This quantity is much larger than the volume held in storage by the greatest Nile reservoir. The supply will be secured from the Verde and the Salt rivers, which drain a watershed of 6,260 square miles. The average yearly rainfall over this drainage basin is not over twenty inches. The annual rainfall upon the territory to be irrigated ranges from three to ten inches; and the rapid evaporation of moisture is indicated by the fact that the temperature in summer ranges as high as 120 degrees, although the elevation varies from 1,000 to 1,300 feet altitude. The dam will impound sufficient water to fully irrigate 270,000 acres of soil.



VIEW ALONG THE FACE OF THE DAM UNDER CONSTRUCTION AT ROOSEVELT.

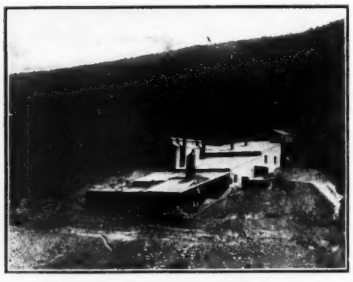
To provide a structure which would be of sufficient strength to withstand the enormous water pressure, also the force of the rivers when in flood, a dam was planned having the total height of no less than 284 feet above the rock formation of its site. The length of the dam at the bottom is 235 feet, but as the gorge rapidly widens at this point the length at the top will be no less than 1,080 feet when it is completed. The vast quantity of material required can be estimated when it is stated that the thickness of the dam at the bottom is not less than 175 feet while the crest of the work will be wide enough to permit a highway for vehicles from one side of the Salt River to the other.

When the engineers in charge of the project arrived at the site of the main dam, they found themselves in an absolutely desolate country many miles from the nearest railway station and without even a wagon trail. One of the first steps was to build a system of roads over which to haul material. A power house, a cement mill, habitations for the people, a water supply had to be built and the result was, the town of Roosevelt came into existence merely to provide facilities for constructing the dam. Rock was quarried from the vicinity and deposits of sand discovered suitable for the manufacture of concrete, while from a tract of woodland some distance away, timber was obtained. With these bases of supply, work was begun upon the dam in September, 1906, and has been in progress almost continually since that time, consequently a considerable percentage of the great wall is now in position, as is shown by the illustrations.

In the construction, electricity per-

forms a great variety of work, conveying most of the rock as well as the concrete and other material in addition to furnishing power for drills, rock crushers, the machine and blacksmith shops and operating all of the aerial tramways. Rock, set in concrete, is required for filling in behind the face, and boulders as large as can be handled are used. Nearly 400,000 cubic yards of masonry will be placed in position when the dam is completed, and the reservoir which it will create will form a lake twenty-five-and-one-half square miles in area. As soon as the dam is finished, the cement mill and other construction plants will be stripped of all machinery which can be profitably removed, and the buildings abandoned, as they will be many feet under water when the reservoir fills.

While the Roosevelt dam proper is the most important feature of the work, the water in the river accumulating below it



THE CEMENT WORKS WHICH WILL BE ABANDONED AFTER MACHINERY IS TAKEN AWAY. THE WORKS WILL BE SUBMERGED WHEN RESERVOIR IS FILLED.

is also to be conserved for irrigation purposes, and at a point thirty miles below a diversion dam is being constructed. It is intended to keep the water of the Salt and Verde rivers at a certain level, and to increase their depth to the extent of fifteen feet over the present low-water average. An idea of the dimensions of this dam can be gained when it is stated that it will be nearly 1,300 feet long, and will require 40,000 cubic yards of concrete before it is completed. A distributing canal is being built in connection with regulating gates, which will have a flow of at least 2,000 feet per second. This is located upon the north side of the dam. Another canal with the capacity of 1,000 feet per second is being constructed on the south side. The site of this operation is at what is known as Granite Reef, about thirty miles from Phœnix. It will furnish the water which will be served by the electric pumps already referred to, the service covering 40,000 acres.

Michigan Electric Association.

The third annual convention of the Michigan Electric Association will open Tuesday evening, August 17, in the Convention Hall at the Hotel Tuller, Detroit. This first session will be taken up with papers and discussions on tungsten lamps. There will be presented about six or eight short papers and informal discussion following.

The second session will be called to order Wednesday morning at 10 o'clock and will be devoted largely to motor and power business. The third session will be held Thursday morning at 10 o'clock and will be taken up with electric-heating business and appliances.

The Hotel Tuller is located at the corner of Park Street and Adams Avenue, overlooking Grand Circus Park. The rates are $2 per day and upward for single rooms, and for two in a room, $1.50 each, per day.

Delightful entertainment features have been arranged for both delegates and ladies. A boat ride on the fine excursion steamer *Sappho,* followed by a dinner at Bois Blanc Island, will be one feature. A theatre party, baseball game and an automobile ride will be other features. The entertainment committee urges all members to bring the ladies with them. They will be well taken care of during the business sessions.

Delegates will do well to arrive Tuesday afternoon, if possible, and register and get badges at the secretary's office in room 215, on the second floor, as a large attendance is expected. This will leave the evening free for the first business session, which will be called to order at 8 o'clock.

Navy Department Supplies.

The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids on August 24 for miscellaneous dry batteries, graphite brushes, 1,500 arc-lamp carbons, 4,000 feet ebonite rod, miscellaneous desk lamps, and two motors, for delivery at Norfolk, Va.; also for miscellaneous fans, armatures and other supplies for delivery at various yards.

Bids will be opened August 31 for insulating a room in basement of Naval Medical School Building, Washington, D. C.

On September 13 bids will be opened for one electrical air compressor, for delivery at the navy yard at Puget Sound, Wash.

Coal Production in Pennsylvania.

The total production of coal in Pennsylvania in 1908, as reported by the United States Geological Survey, was 200,448,281 short tons, having a spot value of $276,995,152. This included 74,347,102 long tons (equivalent to 83,268,754 short tons) of anthracite, with a spot value of $158,178,849, and 117,179,527 short tons of bituminous, with a spot value of $118,816,303.

The production of both anthracite and bituminous coal in Pennsylvania in 1908 was less than in 1907, but owing to the fact that anthracite no longer enters to any great extent into manufacturing industries, it was less seriously affected by the financial depression than bituminous coal. The aggregate production of both kinds in 1908 showed a decrease of 35,299,208 short tons, or 14.97 per cent, in quantity and of $42,252,930, or 13.24 per cent in value from that of 1907.

In the bituminous-coal mines the number of mining machines employed and the percentage of machine-mined coal to the total production increased in 1908, there being 5,103 undercutting machines in use, against 4,940 in 1907, and the percentage of machine-mined coal to the total increasing from 40.48 to 44.76. Of the machines in use in 1908 in the bituminous mines, 3,427 were pick machines and 1,607 chain-breast, the remainder being of other types.

It is estimated that in Pennsylvania 16,970,000,000 tons of anthracite remain yet to be mined, and 109,000,000,000 tons of bituminous coal.

Electric Lights for the United States Military Posts.

Although the United States military posts in the Philippines have long been lighted by electricity, similar posts nearer home are still in the semi-darkness of kerosene.

Governor's Island reformed in 1904, and has ever since had sixteen-candlepower incandescent electric lamps in the buildings and fifty-candlepower electric lamps in the streets—3,000 in all—supplied with current by a Brooklyn Edison cable that runs under Buttermilk Channel from a point near Hamilton Ferry.

Now Fort Hamilton is to be rescued. The government has given an order to the Brooklyn Edison Illuminating Company to furnish current for 2,000 lamps, specified, to light officers' houses, barracks, hospital and streets of the reservation.

Payne Tariff Bill Signed.

On the afternoon of Thursday, August 5, President Taft affixed his signature to the Payne Tariff Act, asserting that the Republican party had substantially observed its campaign pledges for a downward revision of the tariff. As a result the United States and its dependencies, beginning at midnight on August 5, passed under another customs régime and the Dingley Law had been relegated to history.

Except some considerable discussion of the proposed rates on carbon electrodes for lighting and some discussion early in the tariff negotiations concerning mica, there has been little evidence of anxiety upon the part of manufacturers of electrical apparatus and kindred supplies concerning the tariff revision. While there is ostensibly a reduction in the rate on carbons, this reduction is not in the nature of a saving. The rate on carbons made entirely from petroleum coke has been reduced, while the rate on carbons made chiefly of lamp-black or retort carbon has been changed from ninety cents per hundred *carbons* to sixty-five cents per hundred *feet*. With the seventeen-hour carbons coming in two-foot lengths the rate under the old law was $4.50 per thousand feet, while under the new schedule it will be $6.50 per thousand feet. It is not expected, however, that this increase will materially affect the sale of imported carbons, as the jobbers and distributors will probably make the same price as usual, and as one person interested in this distribution has aptly, if inelegantly, put it, the factories will have to "come over."

The following tabulation has been compiled from the complete list of duties under the new tariff law, and includes comparisons with the duties levied by the Dingley Act:

Classification of Act of 1897.	Rates of Duty Under—Dingley Law.	New Law.
Alumina, hydrate of, or refined bauxite—		
Containing not more than 64% of alumina	6-10c lb.	4-10c lb.
Containing more than 64% of alumina	6-10c lb.	6-10c lb.
Porous carbon pots for electric batteries, without metallic connections	20%	20%
Clays or earths—		
Unwrought or unmanufactured, n. s. p. f., tons	$1 ton	$1 ton
Wrought or manufactured, n. s. p. f., tons	$2 ton	$2 ton
Mica—		
Unmanufactured or rough trimmed only, lbs	6c lb. and 20%	5c lb. and 20%
Cut or trimmed mica plates or built-up mica, and all manufactures of mica	12c lb. and 20%	10c lb. and 20%
Earthenware—		
Common yellow, brown or gray; plain, embossed or salt-glazed common stoneware, and crucibles, not decorated in any manner	25%	25%
Carbon, not specially provided for	(n. e.)	20%
Electrodes, brushes, plates and disks, wholly or in chief value of carbon	(n. e.)	30%
Blue vitriol, or sulphate of copper	½c lb.	¼c. lb.
Carbons for electric lighting, hundred, made entirely from petroleum coke	(n. e.)	35c per 100 ft.
If composed chiefly of lamp-black or retort carbon	(n. e.)	65c per 100 ft.
Bars or rails for railways—		
Iron, tons	$7.84 ton	$3.92 ton
Steel, tons	$7.84 ton	$3.92 ton
Railway fish plates or splice bars of iron or steel, lbs	4-10c lb.	8-10c lb.
Telegraph, telephone and other wires and cables composed of metal and rubber, or of metal, rubber and other materials		40%
Barbed fence wire	(n. e.)	¾c lb.
Wire heddles	(n. e.)	25c M. and 40%
Flexible metal tubing or hose, not specially provided for, whether covered with wire or other material, or otherwise, including any appliances or attachments affixed thereto		30%
Aluminum—		
In crude form (aluminum scrap), and alloys of any kind in which aluminum is the component material of chief value, lbs	8c lb.	7c lb.
Plates, sheets, bar and rods, lbs	13c lb.	11c lb.
Barium, calcium, magnesium, sodium and potassium, and alloys of which said metals are the component material of chief value		3c lb. and 25%
Copper—		
Plates, rolled, called braziers' copper, sheets, rods, pipes and copper bottoms, lb	2½c lb.	2½c lb.
Sheathing or yellow metal, of which copper is the component material of chief value, and not composed wholly or in part of iron, ungalvanized, lbs	2c lb.	2c lb.
Round iron or steel wire, not smaller than No. 13 wire gauge, lbs	1¼c lb.	1c lb.
Smaller than No. 13 and not smaller than No. 16 wire gauge	1½c lb.	1¼c lb.
Smaller than No. 16 wire gauge, lbs	2c lb.	1¾c lb.
But not less than 35% on any of foregoing	40%	35%
All wire of iron or steel, or other metal except gold or silver, covered with cotton, silk or other material, corset clasps, corset steels, dress steels and all flat wires and steel in strips not thicker than No. 15 wire gauge and not exceeding 5 inches in width, and all wire n. s. p. f.	45%	35%
Tungsten bearing ores of all kinds	(n. e.)	10%
Gutta percha	(n. e.)	35%
India rubber, vulcanized, known as hard rubber	35%	35%
Paving posts, railroad ties and telephone, trolley, electric-light and telegraph poles	20%	10%
Bauxite, crude, tons	$1.00 ton	$1.00 ton
Tungsten, tantalum and wolfram	20%	25% when valued at $200 per ton or less; 20% when valued at more than $200 per ton.

The following appear upon the free list under the new tariff law:

Books, maps, music, engravings, photographs, etchings, bound or unbound, and charts, printed more than twenty years at the date of importation, hydrographic charts and publications issued for subscribers or exchanges by scientific and literary associations or academies, or publications for gratuitous private circulation and public documents of foreign governments.

Magnesite, crude or calcined, not purified.

Copper ore; regulus of, black or coarse copper, and copper cement; old copper, fit only for remanufacture, clippings from new copper and copper in plates, bars, ingots or pigs, not manufactured, n. s. p. f.

Gutta-percha, crude.

Philosophical and scientific apparatus, utensils, instruments and preparations, including bottles and boxes containing the same, specially imported for religious, philosophical, educational, scientific or literary purposes.

Platinum, unmanufactured or in ingots, bars, plates, sheets, wire, sponge or scrap, and vases, retorts and other apparatus, vessels and parts thereof, composed of platinum, for chemical uses.

Uranium, oxide and salts of.

Works of art, drawings, engravings, photographic pictures and philosophical and scientific apparatus brought by professional artists, lecturers or scientists arriving from abroad for use by them temporarily for exhibition and in illustration, promotion and encouragement of art, science or industry in the United States, and not for sale.

Professional books, implements, instruments and tools of trade, occupation or employment, in the actual possession at the time of arrival of persons emigrating to the United States.

No Increase in Price of Carbons.

The National Carbon Company, Cleveland, Ohio, announces that economies now under way in the manufacture of high-grade carbons will enable it to make a reduction in price within the next sixty days. During the deliberations of Congress on the Payne bill some apprehension was felt that if the bill were passed the price of arc-light carbons would be advanced. The National Carbon Company made strenuous denials of such a possibility, and pointed out the reductions which had been made, and stated that the fear of higher prices in the event of the bill passing was unfounded.

Copper Consumption.

The head of one of the largest groups of copper properties in the country says: "I am firmly convinced that the consumption of copper in this country and Europe is now running even with production. A further gain in consumption would serve to wipe out surplus stocks of the metal in no time. While stocks of copper have increased here and abroad, it must not be forgotten that consumption has made very rapid strides. Many concerns are consuming more copper than ever before in their history."

Dissolves Advisory Board.

Owing to the fact that the $50,000,000 tube and terminal project of the Pennsylvania Railroad is now so near completion, that company has dissolved the advisory board of engineers, consisting of General Charles W. Raymond, Charles M. Jacobs, Alfred Noble and George Gibbs.

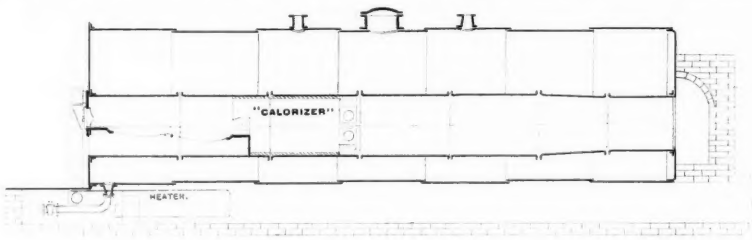
Electrical Notes From Great Britain.

By Our British Correspondent.

India is occupying a very large place in the thought of every Englishman just now. Most of us are hoping that the clouds and rumblings that threaten will end without serious storm or upheaval. We hope this for manifold reasons, but in these notes we are concerned with the serious hindrances to industrial progress which unhappy developments must inevitably produce, hindrances the effect of which would be felt by American as well as British exporters of electrical manufactures. If all goes well India is a land of infinite electrical possibilities, though the progress may continue only gradually for a time, as it has done during the past few years. Already the writer has referred to the headway made in the provision of telephonic service by the Oriental Telephone and Electric Company, and to the undertaking of the Calcutta Electric Supply Corporation. It will now be interesting to allude to the position of electrical affairs in Bombay, where another British company is in possession—the Bombay Electric Supply and Tramways Company—whose report is now receiving attention in London. The company is a member of the Electrical Federation (otherwise the British Electric Traction) group, and its capital expenditure stands at roughly $8,750,000, some $1,160,000 of this having been expended during the past year in tramways electrification and electric-light and power extensions. The tramway route mileage is 20.38 miles, with 162 electric cars. The tramway income was of course affected while the conversion from horse traction was in progress, but it amounted to $635,000, as compared with $525,000 in the previous year. The balance of receipts over expenses was $300,000 as compared with $207,000. There were 30,500,000 passengers carried, and the proportion of expenses to receipts fell from 60.9 per cent to 53.1 per cent. The electric supply produced, exclusive of the revenue from sale of current to the tramway department, about $128,000; there were 803 consumers (588 in the previous year), with the equivalent of 124,856 lamps of eight candlepower connected (84,648 in previous year).

In order to meet demands for energy and reduce generating costs, a new generating station is to be erected at Kussara Basin, where an unlimited supply of sea water is available for condensing, and on a site well placed in regard to facilities for handling coal from either boat or rail. The existing station at Wari Bunder is badly placed, generating costs being high, partly owing to the high cost of condensing water and to the necessity of employing cooling towers because of the distance from the sea. The removal of the generating station to Kussara Basin is expected to produce economies. The Brush Electrical Engineering Company is supplying an additional 4,000 kilowatts of steam-driven plant, and the 4,800 kilowatts will be transferred from Wari Bunder. It is interesting to mention that oil and gas plants were considered in connection with the rearrangement, but it was not thought that these could at present be prudently adopted in substitution for steam plant at Bombay, owing to the large size of the sets required, to uncertainties regarding the price of fuel oil at Bombay, and to other considerations affecting the question of reliability and economy of generation. The London Board has now appointed a local consultative board at Bombay, viz., Sir Sassoon J. David, the Hon. C. H. Armstrong, Shapoorji B. Broacha and Dwarkadas Dharamsi, with the managing director as chairman.

There is being exhibited in London just now the Cowper-Coles "Calorizer," an invention which is being exploited by the firm of Smoke Consumption, Limited, for complete and smokeless combustion of low-grade fuels in Lancashire and Cornish boilers. An incandescent chamber of "Calorizer" bricks is the most important point in the system which received some attention also at the Sheffield coal-smoke abatement exhibition a few months ago. The apparatus aims to prevent the radiation or other loss of heat in the flue gases by means of the bricks mentioned, and the gases and smoke are intimately mixed. The admission of hot instead of cold air to the furnace increases the calorific value of the latter. A certain length of the flue behind the bridge is lined with bricks of a material which is claimed to become incandescent more readily, and at a considerably lower temperature, than ordinary fire clay. At the end of this space (from three feet to six feet from the bridge) a combustion wall is built right across the flue, having a large square aperture serving as a manhole, and built up of a number of specially formed "Calorizer" tiles. As the gases evolved from the fuel pass over the narrow opening above the bridge, they expand into the large and highly heated space between the bridge and the combustion wall, and become well mixed owing to the retardation of their velocity, before passing finally between the incandescent tiles which form the combustion wall.



"CALORIZER" APPARATUS APPLIED TO LANCASHIRE BOILER.

The Marquis of Winchester has recently been in South Africa arranging various matters in connection with the large power contracts, and the general business affairs of the Victoria Falls and Transvaal Power Company, Limited. H. Birchenough, C. M. G., who presided at the meeting of the company in London on July 16, in his absence, put a very optimistic statement before the shareholders. The contract arrangements that have been entered into with the very large and powerful organizations controlling certain of the principal groups of Rand mines for the supply of power to fifteen mines for the next twenty years, enabling him to state that the undertaking which a year ago had a revenue of $800,000, with scope for increase up to $1,500,000, would have a revenue of $4,000,000 a year as soon as the machinery necessary for the supply of the huge demand they had in sight was ready for commercial use. It is stated that the active good-will, and in some cases the powerful financial co-operation, of the great mining groups who see in cheap electrical power a material

element in their prosperity and success had been secured. The difficulty was now not to find customers, but to cope with the demands for power. Sir Charles Metcalfe, who has recently visited the company's station, was present at the meeting, and he stated that they now had something like 12,000 kilowatts in actual use, and in twelve months' time they would have double that amount. Naturally enough, somebody wanted to know something about the chances of the Victoria Falls being utilized, and Sir Charles speaking on this point said that this had been an enormously difficult matter, owing to the attitude of the people of the Transvaal who supplied coal to various companies, and also of the railway authorities who feared loss of revenue if coal was not used. To meet that opposition long-distance transmission had had to be deferred for the present. The station at Drichock, purchased from the General Electric Power Company, is satisfactorily running at full load supplying power to the Consolidated Gold Fields, Limited, group of mines, and the town of Germeston. The original station at Brakpan, purchased from the Rand Central Electric Works, is now mainly used as a reserve for the new 8,000-horsepower installation which was put to work last September. The 16,000-horsepower station at Simmer Pan is making progress, and half the plant is already in commercial use. Orders are on hand which will require the whole 16,000 horsepower as well as necessitating further extensions immediately. The new transmission lines along the reef which were put into use in October last, are working well.

The annual report just received from the Glasgow Corporation Tramways Department shows that for the past year the total length of electric trolley line was 189½ miles (reckoning single track), with 776 cars, 324 of the latter being top-covered, 339 of standard type, the other 113 being converted horse cars. The average number of cars in service was 547; car mileage, 20,802,797; passengers carried, 222,000,000, or 5,000,000 less than the previous year, owing to the depression of trade, which most tramway authorities are blaming. The total receipts were $4,447,655, a decrease of $90,000. The average receipts per car mile were 20.52 cents against 20.98 cents in the preceding year. As to fares over 132,000,000 of the passengers were two-cent fares (59.65 per cent), while 62,000,000, or 28.04 per cent, were one-cent fares. The working expenses were 11.666 cents per car mile, a decrease of 0.12 of a cent. A new 3,000-kilowatt turbo-alternator has been installed at Pinkston power station. Extensive renewals to the two main engines there have just been completed. In order to cope with the increased load on the eastern section of the system, an additional substation has been equipped at Rutherglen. The Glasgow Committee puts aside $2,500 per mile of single track annually to meet cost of track renewals. This year's report, however, shows a considerable decrease in the actual cost of repairs, and maintenance of permanent way and electric equipment. The capital expenditure on the system stands at $16,536,900. For traction and car lighting 25,944,010 units (kilowatt-hours) were used, or 1.25 per car mile. The total energy issuing from power station to substations was 27,755,312 units; there was used in substations, car works, etc., and lost, 1,811,302; there was also lost in conversion and transmission, 1,750,843 units; so that the total issuing for traction load from substation direct-current busbars was 24,193,167 units. The maximum load on the power station was 8,364 kilowatts; load factor 39.8 per cent; coal consumed per kilowatt-hour generated, 3.16 pounds.

Trade depression and the widespread use of metallic-filament lamps are the prevailing tribulations of electric-light and power suppliers in a number of English boroughs. S. E. Fedden, the city electrical engineer of Sheffield, reports a fall of $23,000 in lighting revenue for the past year, although there is an increase in the number of consumers. On the entire supply, however, there has been a profit of $43,750, and this, the engineer advises, should not be placed in reduction of rates, but should be held in hand as an available surplus to meet a possiible deficiency, owing to a further temporary effect of the new lamps in reducing lighting sales. It is unfortunate that the foregoing effect is being borne at the same time as the general trade depression is hindering the oncoming of the power user. Faraday Proctor, the city electrical engineer of Bristol, also complains of both these hindrances to the full development of his undertaking, though he has increased the motors and heating custom from 7,103 to 10,179 horsepower during the past year. The net result in this case is a deficiency of $1,525 on the year's working, and Mr. Proctor, in reporting, indicates that restricted lighting consumption must be expected during this year also; then, he looks forward to a steady increase in consumption for all purposes. Sheffield and Bristol are among the leading English municipal electric-light and power undertakings, and with their power-supply opportunities could in normal times stand up better than other authorities whose power load is more limited. Their experience may be regarded as typical of that of many like undertakings, but it is only a mild illustration of what small boroughs with little but a purely lighting load must feel.

At this time of the year a batch of annual reports by electrical manufacturers is issued, and a good deal is therefore said regarding the condition of the electrical industry. Perhaps the most astonishing information yet received is the passing of the dividend on the ordinary shares of the Electrical Power Storage Company (E. P. S. accumulators), which until now has had an uninterrupted long series of dividend-paying years. Notwithstanding this fact, however, the Electrical Construction Company, Limited, which owns much of the capital, reports, on the whole, a considerable improvement in business. The depression is thought to be passing away, and while the reduced demand for plant due to that depression and to the metal-filament lamps affected the volume of home orders received, this was to some extent counteracted by an increase in export business. The General Electric Company, Limited, has cleared an additional $92,000 net profit as compared to the previous year and is devoting this amount to the strengthening of its reserves, after paying five per cent dividend on its ordinary stock. The big business that the company has been doing in "Osram" lamps has doubtless greatly helped to secure this result. The lamps are now being manufactured at the Hammersmith factory, where shortly about 1,000 skilled workers will be engaged thereon.

Crompton & Company, Limited, of Chelmsford and London, have also issued a report which, from a shareholder's point of view, is disappointing, for the dividend has been passed. With monotonous reports such as this from manufacturers, small wonder is it that we are all climbing the heights on the lookout for signs of real and lasting trade revival.

ALBERT H. BRIDGE.

London, July 24, 1909.

Book Reviews.

ALTERNATING CURRENTS.

"Alternating Currents." By Alfred W. Marshall. Spon and Chamberlain, New York, N. Y. Paper, 90 pages (5x7 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $0.25.

This book is written for those who desire elementary information about alternating electric currents. In seven chapters, in non-technical language, the author describes what an alternating current is, how such currents are produced, how they are measured, transformers and choking coils, alternating-current motors, rotary converters and rectifiers. This little book is especially intended for amateurs, both old and young, who take an interest in mechanical and electrical work.

"Practical Alternating Currents and Alternating-Current Testing." By Charles T. Smith. Manchester, Eng.: Scientific Publishing Company. Cloth, 455 pages (5¼x 8½ inches), illustrated.

The third edition of this book should prove of value to students in technical schools and young engineers, engaged in the handling and testing of alternating-current machinery, particularly, on account of the practical, rather than abstract theoretical, manner in which the author handles the subjects being considered. Save for a chapter on curve analysis, the use of higher mathematics has been avoided, using instead an experimental method of treatment. The experiments are described in great detail, so as to enable the conclusions derived from them to be followed by the reader who has not the means for obtaining experimental results of his own. For the present issue, a fundamental revision has been undertaken, and, in order to make room for new matter, a good many sections of the earlier editions have been much condensed. Alterations of this character are especially numerous in the chapters on transformers and alternators, to which many additions have been made. The chapter on induction motors has been largely rewritten, and a chapter on single-phase motors has been added.

ELECTROCHEMISTRY AND ELECTROMETALLURGY.

"Electric Furnaces." By Wilhelm Borchers. Translated by Henry G. Solomon. Longmans, Green & Company, New York, N. Y. Cloth, 224 pages (5¼x8¼ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $2.50.

This volume is an English version of the second German edition of Die elektrischen Ofen. The recent rapid development, notably abroad, of the electric furnace is sufficient proof of the important part it is playing, and is destined to play in a still greater degree in the near future, in connection with all classes of metallurgical operations. The method of treatment and classification of electric furnaces adopted is from the point of view of the heating system on which their action is based, and their development and application are treated in an authoritative and critical manner. As close a translation of the original as possible has been adhered to, and the English equivalents of the metrical measurements given in the text have been added. The subject-matter, also, has been further arranged under suitable headings in chapters corresponding with the main chapters of the original.

"A Study of Electrothermal and Electrolytic Industries." Part I. By Edgar A. Ashcroft. New York, N. Y.: McGraw Publishing Company. Cloth, 130 pages (5¾x 9¼ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $2.00.

It is the aim of the author, in this treatise, to give the reader the practical information about nearly all industrially successful processes in electrometallurgy and electrochemistry possessed by those practicing the various specialized branches of the industry. The arrangement of the work is novel. The general division is into three parts, the present volume (Part I) dealing with the more general aspects of the subject, such as the theory of electrochemistry, electrochemical and electrothermal calculations, value of electrochemical and electrothermal processes, general designs, for industrial plants and the production of cheap electrical energy.

ELECTRICAL ENGINEERING—GENERAL.

"Heavy Electrical Engineering." By H. M. Hobart. D. Van Nostrand Company, New York, N. Y. Cloth, 338 pages (5¼x9 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $4.50.

This work contains features and calculations of which a sound knowledge should be acquired in order to enable one to effectively engage in electrical engineering. Throughout the book questions concerning the design of apparatus are regarded as subsidiary to those relating to the design of the stations in which the apparatus is employed. Rather than a consideration of the design of electrical machinery, steam boilers, piston engines, steam turbines, gas engines, pumps, condensers, cooling towers, and other apparatus, the author, in the early chapters of the book, aims to have the reader acquire familiarity with the results which can be obtained from the principal among these component pieces of apparatus, and to learn to correctly combine them for efficient service in aggregates which are denoted as generating stations.

The subject matter of the chapters is as follows: The over-all efficiency of generating stations and the relation between coal consumption and outgoing electrical energy, steam-raising plant, piston engines and steam turbines, condensing plant, electric generating plant, the design of generating stations, high-tension power transmission lines, high-tension continuous-current series system, electric traction calculations, and traction motors and electrification of railways.

"Water-Power Engineering." By Daniel W. Mead. McGraw Publishing Company, New York, N. Y. Cloth, 87 pages (5¾x9 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $6.00.

The theory, development and investigation of waterpowers are the subjects treated in this work. The author has endeavored to consider, briefly at least, all fundamental principles and to point out the basis on which successful water-power depends. In current practice, the hydraulic engineer, to determine the extent of a proposed hydraulic development, commonly depends on a study of monthly averages of steam flow and of observed maximum and minimum flows, or, in other cases, the development is predicted on a single or very few measurements of what is believed to be low-water flow of the stream. In chapters four, five, seven and nine a more exact method of studying flow by actual or comparative hydrographs is described. A detailed study of the daily effect of the head available on power is presented in chapters four and five. In chapters five, seven and eight a method is outlined for the consideration of possible variations in flow during periods for which no measurements are available. A study of the effect of pondage on power is discussed in considerable detail in chapters four, five and twenty-six. The author has developed the method of turbine analysis and selection in chapters fourteen and sixteen, and in chapter twenty-eight is outlined his idea on an intelligent report on a waterpower project.

"General Lectures on Electrical Engineering." By Charles Proteus Steinmetz.

Robson & Adee, Schenectady, N. Y. Cloth, 284 pages (5¾x9 inches). Supplied by the Electrical Review and Western Electrician for $2.00.

This work comprises a set of lectures on electrical engineering, published in a very attractive volume. The lectures are general in their nature, dealing with problems of generation, control, transmission, distribution and utilization of electric energy; that is, with the operation of electric systems and apparatus under normal and abnormal conditions, and with the design of such systems. The design of apparatus is discussed only so far as it is necessary to understand their operation, and so judge of their proper field of application. Due to the nature of the subject and limitations of space, the treatment had to be essentially descriptive, and not mathematical. It comprises a discussion of the different methods of application of electric energy, the means and apparatus available, the different methods of carrying out the purpose, and the relative advantages and disadvantages of the different methods and apparatus which determine their choice. It must be considered, however, that such discussions can be in general only, but as a whole this work should prove of interest both to the student and the engineer.

"A History of the Warfare of Science with Theology." Two volumes. By Andrew Dickson White. D. Appleton & Company, New York, N. Y. Cloth, 415 pages, volume I; 475 pages, volume II (5¾x8½ inches). Supplied by the Electrical Review and Western Electrician for $5.00.

The author, in this work, is simply trying to let the light of historical truth into that decaying mass of worn-out thought which attaches the modern world to mediæval conceptions of Christianity, and which still lingers among us, a most serious barrier to religion and morals, and a menace to the whole normal evolution of society. Behind this barrier a flood of increased knowledge and new thought is rapidly rising, and though it is thin in places, it creates a danger of sudden breaking away, distressing and calamitous, sweeping before it not only outworn creeds and noxious dogmas, but cherished principles and ideals, and even wrenching out precious religious and moral foundations of the whole social and political fabric. The author's aim is to aid, even but little, in the gradual and healthful dissolving away of this mass of unreason, that the stream of "religion pure and undefiled" may flow on, broad and clear, a blessing to humanity.

"How to Understand Electrical Work." By William H. Onken, Jr., and Joseph B. Baker. Harper & Brothers, publishers, New York, N. Y. Cloth, 359 pages (5½x7½ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $1.75.

This book is a simple explanation of electric light, heat, power and traction in daily life. It tells how and why "the wheels go round" when the force that drives them is electricity. The book being intended for younger readers, the explanation and descriptions are given in a non-technical, simple and interesting manner. It is impossible in a book of this size to give detailed descriptions of all the uses to which electricity has been put in daily life. However, the subject has been treated so as to give the youth a fair impression of the universality of its application. The book contains nineteen chapters and a dictionary of electrical terms which is very instructive. Some of the chapters which should prove of general interest are electricity in the home, electricity in farming, electricity in the hospital, electricity aboard ship, electricity in mining, electricity in the manufacture of steel, electric protection, electricity the destroyer and transmission of intelligence.

"The Copper Handbook." By Horace J. Stevens, Houghton, Mich. Cloth, 1,500 pages (5¾x8½ inches). Supplied by the Electrical Review and Western Electrician for $5.00.

In this book copper is considered under a great variety of heads in the preliminary chapters, giving in non-technical language a vast amount of useful information relating to the geology and mineralogy of copper and copper ores. Much space is devoted to mining, milling, smelting, leaching and refining, making the work an encyclopedia of copper. The principal chapter of the book, covering over a thousand pages, is devoted to detailed descriptions of the copper mines of the globe, the author being exceedingly frank in his comments regarding companies he considers dishonest. To the investor or speculator in copper shares, this chapter will prove very helpful. In the present edition this chapter has been completely rewritten, with an addition of more than two thousand mining companies over the number listed in the previous edition. The final chapter is devoted to statistics and is very complete, its authority being recognized by the copper trade.

"An Introduction to the Science of Radio-Activity." By Charles W. Raffety. Longmans, Green & Company, London, Eng. Cloth, 208 pages (5x7¾ inches).

In this book the author gives a clear, concise and popular account of the properties of radio-active elements and theoretical conceptions which are introduced by the study of radio-active phenomena. This work, as its title indicates, is no more than an introduction to the subject, and no attempt has been made at exhaustive treatment. The subject is divided into three parts, descriptive, theoretical, and practical, the last being of interest to those wishing to investigate for themselves some of the remarkable properties of radio-active elements, on account of the comparatively simple experiments described. The first part deals with the rays emitted by radium, the nature of the rays and methods of investigation, in a very interesting manner.

"Hydroelectric Development and Engineering." By Frank Koester. D. Van Nostrand Company, New York, N. Y. Cloth, 454 pages (7¼x10¼ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $5.00.

The student, in this text, will find a practical and theoretical treatise on the development, design, construction, equipment and operation of hydroelectric plants, from their inception to the delivery of power to the substation and consumer. For a clearer comprehension of the subject considered, the author has systematized his discussion by a division of the matter into three parts, namely, the transmission of waterpower into electrical energy, the transmission of high-tension electrical current, and modern American and European hydroelectric developments, the last part comprising the appendix. In Part I the opening chapters deal with the proposition to be considered, giving, briefly, important laws of hydraulics. An interesting study of dams is given showing the conditions and laws that govern the construction of various types of dams. The subjects of headrace and penstocks are discussed fully. The power plant is treated on an extensive plan. The general arrangement and design, excavation and foundation, the superstructure and the structural steel are all given due consideration under the general heading of power plants. The mechanical and electrical equipment is discussed in separate chapters. The author in treating the subjects named above considers the selection from different makes, of an assemblage of machines and devices best fitted to perform its particular function and to have the machines properly combined to form one complete unit rather than the design of the various machines. Under Part II

the subjects of transmission, substations and line protection are treated. The author is of the opinion that a good illustration may tell more at a glance than a lengthy discussion, hence numerous photographs and cuts are used in illustrating the appendix, which contains many interesting features regarding American and European hydroelectric plants now being successfully operated.

POWER STATIONS—STEAM TABLES.

"Steam Tables and Diagrams." By Lionel S. Marks and Harvey N. Davis. Longmans, Green & Company, New York, N. Y. Cloth, 106 pages (6¼x9 inches). Supplied by the Electrical Review and Western Electrician for $1.00.

This work, which gives the tables and diagrams of the thermal properties of saturated and superheated steam, should prove of value to mechanical engineers. The necessary basis for any determinations of the properties of superheated steam are the investigations of Knoblauch, Thomas and Henning. The authors have subjected these investigations to a careful analysis, both as to the probable errors resulting from the methods of experimentation, and also as to the relation of the experimental results to the values deduced from thermodynamic theory. The properties of superheated steam are tabulated for every pound pressure, and for every ten degrees of superheat, within a range which exceeds present practice. All the information relating to superheated steam of any pressure is given on one double page, an arrangement which permits the immediate finding of any desired quantity. Supplementary tables extend the superheated-steam table to very high temperatures, and give the properties of water, metric conversion factors, Naperian logarithms and other quantities. Besides the tables two large diagrams are given, showing the properties of saturated and superheated steam. These diagrams can be used instead of the tables in several instances, but their chief purpose is to facilitate certain calculations. They should prove very useful to anyone engaged in making calculations which involve saturated or superheated steam.

"Electric-Railway Power Stations." By Calvin F. Swingle, Chicago, Ill. Frederick J. Drake & Company, Chicago, Ill. Cloth, 718 pages (5x7½ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $2.50.

This book, in a plain, practical manner, treats upon the central station, with its modern appliances for the economical consumption of fuel, and the production of heat, its machines of various types, such as steam engines and turbines, gas engines of all kinds, and other forms of prime movers, by means of which this heat is transformed into energy or power capable of turning the dynamos, which in turn transmit this power, in the form of electrical energy, to where it is needed to do the work. The author has taken the standpoint of the operating engineer rather than the designer and touches only the important topics of design and construction. Among the commendable features of the book, are the questions and answers at the conclusion of each chapter. The questions discussed are ones frequently asked regarding the apparatus considered; thus the book is of considerable value in making clear features of a practical and useful nature.

"Boiler-Feed Water." By Fred. A. Anderson. The Electrician Printing and Publishing Company, London, Eng. Cloth, 154 pages (5¼x8½ inches). Supplied by the Electrical Review and Western Electrician for $2.50.

This book brings together much valuable information regarding the questions of corrosion and priming. It embodies a concise account of the most important impurities to be met with in feed waters, especially in land installations, together with the methods for their detection and removal. The details of the analytical part have been given, to show precisely how the data are arrived at upon which the treatment of a water is based, and should prove of value to anyone contemplating such analysis. The subject matter of the chapters is as follows: Scale formation and corrosion, analysis of hard waters, calculation of results, water softening, oil or grease, and steam boilers, discussing their selection, management, cleaning and inspection. The chapter on water softening should afford assistance to anyone contemplating the installation of any water-softening or purifying apparatus.

"Steam Power Plant Piping Systems." By William L. Morris. McGraw-Hill Book Company, New York, N. Y. Cloth, 490 pages (6x9¼ inches). Supplied by the Electrical Review and Western Electrician for $5.00.

As is suggested by the title, this publication treats only such parts of the power plant system as are directly related to piping. Although the design of boilers and engines has not been touched upon, their operation is duly considered in the design of various systems of piping connecting the two. All auxiliary apparatus in the pipe circuit between the boiler and the engine, and in the various piping systems for steam, oil, air, etc., have been treated and their design thoroughly discussed. The first chapter of this work is devoted to the origin and results of improper piping. The author lays much stress on improper piping, asserting that the chief requisite in pipework engineering is so to design as to permit repairs of disabled lines, without interfering with the regular service of the plant, and much trouble in power stations is due to inferior designing in this respect. The author has given a detailed and consecutive treatment of the entire subject of piping, as applied to power stations, taking up the design, installation and operation. A system of reasoning and analyzing has been followed that alone in itself is very instructive.

LIGHTING AND ILLUMINATING ENGINEERING.

"Electric Lamps." By Maurice Solomon. D. Van Nostrand Company, New York, N. Y. Cloth, 321 pages (5¼x8 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $2.00.

In this book the author only attempts to describe the lamps that have been proved to be of commercial use, no attempt being made to treat those in the experimental stage. Starting with the general principles of artificial illumination, in chapter one, the author discusses the production of this illumination in chapter two. Chapter three treats of photometry. The definitions of the five fundamental quantities used in photometry, photometric methods, heterochromatic photometry, illumination photometers, and standards of light are some of the topics discussed in this chapter. Methods of testing is the subject matter of chapter four. As the testing of lamps divides itself naturally under two heads, the author divides this chapter under two heads, namely, the "distribution of the light" and "life testing." Under the distribution of light comes the test of what is generally known as the "efficiency" of the lamp, which is dealt with quite fully in this chapter. The remaining chapters of the book deal with the electric lamps now in use, describing the construction, efficiency and methods of testing each.

"Electrical Illuminating Engineering." By William Edward Barrows. McGraw Publishing Company, New York, N. Y. Cloth, 216 pages (5x8¼ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $2.00.

This book should prove of benefit to illuminating engineers. Throughout the book, the author confines himself to laws, formula and tables, the size of the book

and the scope covered prohibiting descriptive detail. The early chapters of this work are devoted to units of illumination, light and color, photometry and photometers. The remaining chapters treat in detail the various lamps and reflectors in use today. The final chapter is devoted to illumination calculations.

TRANSFORMERS—INDUCTION COILS.

"Transformers." By Gisbert Kapp. The Macmillan Company, New York, N. Y. Cloth, 364 pages (5½x8¾ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $3.00.

This present volume is the second revised and enlarged edition. It has been the author's aim, in this edition, to show how by a careful study of the thermic condition the output of a transformer of given weight and cost may be increased. He has also considerably enlarged the part dealing with the testing of transformers and iron samples. It is claimed by the author that a thorough scientific knowledge of the principles of the modern testing sets and the ability to do equal or better work by means of apparatus built up for the occasion by using the appliances usually found in the testing of electrical engineering works, should be within the reach of the practical engineer; hence the amount of space he gives to the theoretical side of testing. Another addition is the chapter on the relations between the transformer and its circuits. Although not strictly a question of design, it is still a most important matter, since it involves the safety of extended and, as a rule, expensive networks. In all cases possible, the author has used graphic in preference to analytical methods of description. The examples of modern transformer work, in the final chapter, will be found very interesting.

"Stationary Transformers." By William T. Taylor, New York, N. Y. McGraw Publishing Company. Cloth, 169 pages (4¾x7¼ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $1.50.

In this book the author has endeavored to compile a list of notes, gained from years of practical experience in the connection, installation and operation of transformers. To aid in understanding quickly the phase relations and relative values of the various electromotive-forces and currents involved in a given system, vector diagrams are given with all diagrams of circuit connections. The subject matter of the chapters is as follows: Single-phase transformer manipulations, two-phase connections, three-phase transformation, three-phase difficulties, three-phase-two-phase systems, six-phase transformation, cooling of transformers, auto-transformers, constant-current transformers, series transformers, regulators and compensators, transformer testing and modern distribution systems.

"The Design and Construction of Induction Coils." By A. Frederick Collins, New York, N. Y. Munn & Company, New York, N. Y. Cloth, 272 pages (5½x9 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $3.00.

This work, as is suggested by its title, treats of the design and construction of induction coils. In easily comprehensible language it describes each process in sequence, together with the dimensions of each part. Coils varying in size from small ones giving one-half-inch sparks to large ones giving twelve-inch sparks are treated. In many instances the author, by means of illustrations and diagrams, shows how to accomplish each step in the manufacture of the coils. Chapter nineteen treats of the cost and purchase of materials, which makes it possible for the amateur to buy materials at a minimum cost. Chapter twenty contains many very useful tables, formulas and data, which would be of benefit to anyone interested in induction coils.

TRANSMISSION AND DISTRIBUTION—CABLE NETWORKS.

"The Theory of Electric Cables and Networks." By Alexander Russell, New York, N. Y. D. Van Nostrand Company. Cloth, 269 pages (5¼x8¼ inches). Supplied by the Electrical Review and Western Electrician for $3.00.

In this book the author has given some information concerning the phenomena connected with the flow of current along conductors and across dielectrics, also concerning the dielectric strengths of insulating materials and electric stresses to which they are subjected under working conditions. Questions in connection with the electrostatic capacity and the inductance of cables have not been considered, these being taken care of in another book. In chapter one the fundamental electrical principles are stated and a description is given of the various gauges in use for specifying wires. Conductivity is discussed in chapter two, and special attention is devoted to the effect of the "lay" on the weight and conductivity of stranded cables. In chapter three the standard methods of measuring insulativity are discussed. The design of distributing networks is explained in chapter four, particular stress being laid on "feeding centers" and on the importance of calculating their positions. In chapters five, six and seven methods of measuring the insulation resistance of house wiring and distributing networks are given. The dielectric strength of materials is discussed in chapter eight. In chapter nine the grading, and in chapter ten the heating, of cables is considered. In chapter eleven, the interesting subject of electrical safety valves is considered, and chapter twelve is devoted to the subject of lightning conductors.

"Practical Calculation of Transmission Lines." By L. W. Rosenthal. McGraw Publishing Company, New York, N. Y. Cloth, 94 pages (6x9¼ inches). Supplied by the Electrical Review and Western Electrician for $2.00.

This book should prove a practical help in the rapid and accurate calculation of transmission lines. The arrangement of the formulas, tables and text has been dictated solely by the needs of the rapid worker. All sections save the last include the important effects of temperature and specific conductivity. The section relating to direct-current railways is novel in the form of its tables, and the methods outlined in it have been found rapid and comprehensive. The alternating-current division presents a new and original method for the solution of these problems. The chapter on single-phase railways is in accord with most of the consistent data published on the subject, although further accurate investigations of installed lines may modify to some extent the present accepted values. The scope of this book has been confined to methods of calculation, hence, the most desirable limits of line losses are not discussed. However, the tables are sufficiently extended to cover all cases likely to arise in practice.

"Conductors for Electrical Distribution." By F. A. C. Perrine. D. Van Nostrand Company, New York, N. Y. Cloth, 287 pages (6x9¼ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $3.50.

This book treats quite extensively the subject of conductors for electrical distribution, their materials and manufacture, the calculations of circuits, pole-line construction and underground working. The early chapters of this work are devoted to conductor materials, alloyed conductors, and the manufacture of wire and cables. The chapter on the manufacture of wire is particularly interesting and instructive, it being a hitherto untreated subject. The author gives an extensive report on the methods used in some of the well-known manufacturing plants. Several chapters are required for a thorough study of electrical calculations, such as calculation of circuits, calculation of multiple arc circuits and alternating-

current calculation. The final chapters describe overhead lines, the pole line, line insulators, and underground conductors.

"Electrical Circuits and Diagrams." Part II. By Norman H. Schneider. Spon & Chamberlain, New York, N. Y. Paper, 74 pages (5x7 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $0.25.

This book contains sixty-seven electrical circuits and diagrams, a brief but instructive note accompanying each.

"Submarine Cable Laying and Repairing." By H. D. Wilkinson. The Electrician Printing and Publishing Company, London, Eng. Cloth, 558 pages (5¼x8¼ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $6.00.

In its present form the second edition of this work should help to maintain and foster the desire for progress and development and prove of assistance to those who are endeavoring to attain greater efficiency in submarine-cable practice. It gives a detailed technical summary of modern practice in manufacturing, laying, testing and repairing a submarine telegraph cable. The early part of this treatise is devoted to surveying the route of a cable, giving detailed information regarding sounding, and the design and use of sounding machines. The testing section and details of practice aboard-ship have been prepared to give further insight to this branch of engineering. The description of the equipment of cable-ships and the mechanical and electrical work carried on during the laying and repairing of a submarine cable will prove interesting to some, not engaged directly in the profession, but who are desirous of informing themselves as to the work which has to be done, from the moment a cable is projected until it is successfully laid and worked.

TELEGRAPHY—WIRELESS TELEGRAPHY AND TELEPHONY.

"Lessons in Telegraphy." By Charles Henry Sewall. D. Van Nostrand Company, New York, N. Y. Cloth, 90 pages (4¾x7¼ inches). Supplied by the Electrical Review and Western Electrician for $1.00.

This book furnishes the student with an elementary course of instruction in the art of sending and receiving Morse telegraph signals. It not only deals with the ordinary instructions necessary to learn the art of telegraphy, but cautions the student concerning what not to do, thereby preventing the early acquirement of bad habits, which, once formed, are difficult to remedy later on. The author endeavors to supply that very important class of information which is too often overlooked in instructing students. In addition to a study of the Morse code and various signals, the book contains many exercises in sending and receiving messages, such as the operator would meet with in the business world today. This book should prove valuable to anyone contemplating the study of telegraphy.

"Making Wireless Outfits." By Newton Harrison. Spon & Chamberlain, New York, N. Y. Paper, 61 pages (5x7 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $0.25.

This little book is written for the purpose of enabling the reader to build a wireless outfit of his own. It gives a concise and simple explanation of the construction and use of inexpensive wireless equipments for capacities up to one hundred miles, including the sending and receiving stations. Full details are given and each step, in sequence, is made clearer, if possible, by drawings of the apparatus, diagrams of circuits, and tables. Many problems are solved and many suggestions are given that avoid a circuitous route.

"Wireless Telephone Construction." By Newton Harrison. New York, N. Y.: Spon & Chamberlain. Paper, 74 pages (4¾x7¼ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $0.25.

In this work the author has been somewhat handicapped in giving a comprehensive explanation of the making of a wireless-telephone equipment, owing to the fact that there are many patents now pending in this field, both in the United States and abroad, which makes it difficult to get points that would prove useful in the construction of an equipment absolutely up to date. In spite of this, however, the work embodies enough features to give one the information needed. The use of electric waves for audible speech transmission and the system by means of which they are employed successfully over distances of many miles are points treated in this work, which should interest the man who wants to know something regarding new inventions and their application. The construction of the transmitting station with its parts, including the wave producer or arc lamp as modified by practice and the receiving station, with its detector, are entered into, so that the main ideas involved are rendered clear. In short, the author has expressed clearly and concisely the information necessary for the making of a wireless-telephone equipment.

ARMATURE AND MAGNET WINDING—TESTING—NAVAL ELECTRICIAN'S HANDBOOK—SMOLEY'S TABLES—RAILWAY ACCOUNTING.

"Practical Armature and Magnet Winding." By Henry C. Horstmann and Victor H. Tousley. Frederick J. Drake & Company, Chicago, Ill. Morocco, 231 pages (4¼x6½ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $1.50.

In this work an effort has been made to supply working electricians with a practical treatise on armature and magnet winding. Special stress has been laid upon the practical side of the subject, so as to enable the student to see clearly the exact manner in which the work is actually performed. Sufficient of the theory of armature winding has been given to enable the student to comprehend fully why certain precautions and methods are necessary. Without this theory, an intelligent understanding of the necessity of complying with these conditions is impossible. The book contains many illustrations and diagrams which simplify the descriptions, making the book valuable both as a text-book for the student and a handbook for the electrician.

"Shop Tests on Electric-Car Equipment." By Eugene C. Parham and John C. Shedd. McGraw Publishing Company, New York, N. Y. Cloth, 121 pages (4¾x7¼ inches). Supplied by the Electrical Review and Western Electrician for $1.00.

This book is the first of two books to cover in a practical manner the testing of electric-car equipment with such instruments and other facilities as may be available or obtainable in a car house. An effort is made to so present the subject that the instructions and information given can be properly used. To this end simple explanations, illustrations and practical examples are frequently used. In the methods given, refinement is at times sacrificed to practicability, with the object of showing how results are obtained rather than how they might be. The book is divided into three general heads, current measurements, voltage measurements and resistance measurements. Each general heading is subdivided, giving detailed descriptions of each method of measuring and testing.

"Naval Electricians' Text Book." By W. H. G. Bullard, U. S. N. United States Naval Institute, Annapolis, Md. Cloth, 976 pages (5¼x9 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $6.50.

This book is the revised and enlarged edition of the Naval Electricians' Text and Hand Book. Many new chapters have been added to the original manuscript and all have been more or less rewritten to such an extent that it has lost its handbook characteristics. There is probably little or nothing contained in the work which could not be found elsewhere, but the author has collected in one volume complete information concerning

the principles and uses of electricity on our war vessels. Although the information given was primarily intended for officers and enlisted men of the navy, electricians in general should find it useful, as there is much general electrical information given. This is true, particularly in the early chapters of the book, which deal with general principles of electricity, such as the definitions of the units, magnetism and electromagnetism, elementary theory of the electric generator, primary batteries, and theory of motor control. The two final chapters are devoted to the principles of wireless telegraphy and principles of wireless telephony.

"Smoley's Tables." By Constantine Smoley. The Engineering News Publishing Company, New York, N. Y. Flexible morocco, 448 pages (4¾x7 inches). Supplied by the Electrical Review and Western Electrician for $3.50.

In addition to the parallel tables of logarithms and squares of feet, inches and fractions of inches, varying from one thirty-second of an inch from zero to fifty feet and by one-sixteenth of an inch from fifty to one hundred feet, and the tables of angles and logarithmic functions corresponding to given bevels, this fifth revised edition contains a multiplication table for rivet spacing, with a new set of five-decimal logarithmic-trigonometric tables. These tables comprise the following separate tables: Common logarithms of numbers from zero to 10,000, with tables of proportional parts; logarithms of the sine and tangent from zero degree to three degrees and of the cosine and cotangent from eighty-seven to ninety degrees, varying by ten seconds, with proportional parts for single seconds, logarithms of the sine tangent, cotangent and cosine for each minute of the quadrant, with proportional parts for single seconds and the table of natural functions. This book should appeal to engineers and draftsmen who have a variety of computations to deal with.

"Electric-Railway Auditing and Accounting." By William H. Forse, Jr. McGraw Publishing Company, New York, N. Y. Cloth, 157 pages (6x9¼ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $2.00.

This book combines some of the best ideas obtainable, regarding methods of accounting, from many sources. The accounting requirements of interurban railways engaged in local and interline business have been carefully considered, and some special features of city railway accounting are explained. The author has endeavored to eliminate from the methods outlined those which tend to sacrifice the three essential features of any good system of accounting, namely, clarity, accuracy, and comparative economy. Interurban lines have adopted many of the operating features of the steam railway, chief of which may be mentioned the sale of tickets, the establishment of stations and the handling of freight, baggage and express. This development, naturally, has brought many problems to the accountant, and the author has outlined the manner in which some of these problems have been met. The forms illustrated are reproductions of ones actually used by electric railways with the exception that company names are omitted.

"Patents as a Factor in Manufacturing." By Edwin J. Prindle. New York, N. Y.: The Engineering Magazine Publishing Company. Cloth, 134 pages (5¼x7½ inches). Supplied by the Electrical Review and Western Electrician.

This book is written for the avowed purpose of conveying an idea of the nature of a patent, the protection it may afford, the advantages it may possess for meeting certain economical conditions, the safety which may be secured in relation between employers and employes, and the general rules by which the courts will proceed in upholding the patent and in thwarting attempted infringements. It is intended to show the manufacturer, in a general way, what may be accomplished by patents, but not to lead him to attempt such accomplishment without legal advice. The fundamental steps are indicated for the inventor, patentee, or manufacturer, which are usually taken before the advice of counsel is secured. The treatment is lucid and is developed in seven chapters, as follows: 1. Influence of patents in controlling a market. 2. Subject, nature and claim of a ptent. 3. What protection a patent affords. 4. Infringements. 5. Patenting a new product. 6. Patent relations of employer and employe. 7. Contests between rival claimants to an invention. One of the most commendable features of the book is that an index is provided, an unusual departure for books of this type.

"Harper's Machinery Book for Boys." By Joseph H. Adams. Harper & Brothers, publishers, New York and London. Cloth, 373 pages (5¾x8 inches), illustrated. Supplied by the Electrical Review and Western Electrician for $1.75.

This book is on similar lines to Harper's Electricity Book for Boys," by the same author, and comprises an introduction, twenty-three chapters and an appendix. Part I includes the first nine chapters, devoted respectively to: The principles of simple machines; mechanic's tools; power; power transmission; waterpower; windpower; steampower; electric power; hydraulics. Part II includes eight chapters, describing machinery of many sorts. Part III comprises the rest of the book which includes chapters on automobiles, motor boats, the gas engine, shop hints, formulas (alloys, solders, cements, varnishes, etc.) and tables, gauges, and measures. The appendix is a somewhat meager dictionary of mechanical terms. The treatment throughout is necessarily elementary and popular, albeit lucid and graspable. The text and illustrations are both of the best. Any boy at all handy with tools should be able to follow out with ease the instructions in the book to make many useful and instructive working models of mechanical devices, and in so doing should pick up a large amount of practical mechanical information. The book will be heartily welcomed by the American boy with a mechanical turn of mind.

"Social Engineering." By William H. Tolman. New York, N. Y.: McGraw Publishing Company. Cloth, 384 pages (6x9¼ inches). Supplied by the Electrical Review and Western Electrician for $2.00.

The subtitle of this book, "A Record of Things Done by American Industrialists Employing Upward of One-and-One-Half Million of People," explains the main title "Social Engineering." Doctor Tolman describes himself as a "social engineer," and a perusal of the book confirms this nomenclature, as it proves to be a record and discussion of experiments tending toward the betterment of the condition, social, industrial, and utilitarian, of the vast army of what one might term the laboring classes of this country. Apart from the humanitarian and philanthropic side of the question, it would appear that a general improvement of the hygienic arrangements of factories, and an increase of conveniences tending to more comfort of the employes, both in the workrooms and in the places provided for lunches and recreation between times, result in an inincreased efficiency of the working forces and a corresponding increase in the output. Vacations, rewards of various kinds for diligence, conscientiousness, punctuality, and application, the incentives to thrift, the value of safety appliances, the work of educational opportunities given free or at a nominal cost, and many other similar topics, are all treated in a coldly logical manner, yet withal in a most attractive way, as to their beneficial effect,

and are shown to be of the utmost value even considered from the utilitarian viewpoint of the strictest business proposition. The book is a crystallization of the many efforts recently made in a more or less haphazard fashion by divers writers to show the trend of modern successful business application. An introductory note of commendation is prefixed by Andrew Carnegie, whose knowledge of the subject is unquestionably practical.

"Internal Combustion Engines." By Wm. M. Hogle. McGraw Publishing Company, New York, N. Y. Cloth, 256 pages (5½x8½ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $3.00.

This book brings together much valuable information regarding present practice in designing and operating internal-combustion engines. The author has, as far as practicable, eliminated theory and the more involved mathematical formulas and confined the matter contained to the more practical and applied phase of the subject. In the matter of design, average practice has been considered, and formulas are given, which, if followed, should lead to successful results. Several chapters of this work are devoted to descriptions of different types of gas engines, now obsolete, but which show the development of the internal-combustion engines to the present time. The section devoted to practical operation and troubles and remedies should prove valuable. Full instructions for starting, stopping and caring for the gas engines are given. Every possible cause for trouble is considered and a suitable remedy stated. A thorough discussion of all of the various parts which compose the internal-combustion engine is entered into, the author describing only those parts of machines which are in keeping with actual practice. This book also contains tables and formulas which should fill all of the average requirements, either for the designer or operator.

"Atlas der Elektropathologie." By Dr. S. Jellinek. Berlin and Vienna: Urban & Schwarzenberg. 1909. 92 pages (8x11 inches), with 16 illustrations and 96 special plates, with 230 illustrations. Price, 35 marks.

This book is a pictorial compilation of a large number of cases of severe burns on various parts of the human body due to contact with high-tension circuits or to lightning. In the first part, that relating to accidents on high-tension circuits, thirty such cases are described and copiously illustrated; also one that was self-inflicted, and an experimental test on a rabbit. In every case cited the circumstances attending the accident are stated and also generally illustrated. Photographs of the affected organs, principally of the surface of the body, are given, showing some of the most frightful skin burns directly after the accident and at various later periods to show that gradual healing of the tissues and the nature of the scar, if any, that was left. Some of the apparently worst cases healed up without any scar. In several instances there are shown also photographs of the clothing over the affected parts and of the electrical devices that were concerned in the accident. Most of the accidents were due either to carelessness or to failure of insulation. The worst burns were caused by the impregnation of the skin by particles of fused metal.

The second part of the book is devoted to the reproduction of a large number of typical photographs of cables, conduits, lamps, and other electrical appliances that suffered damage from grounds, short-circuits, corrosion and other faults on high-tension circuits. Following this are charts of good insulating materials, approved methods of fusing circuits, and various forms of insulated gloves, suits and pliers suitable for use by linemen and others that have to expose themselves to high-tension circuits.

In the third part of the book accidents due to lightning are treated similarly to those caused by high-tension circuits as related in the first and second parts. There are also shown a number of cases where lightning-protection equipment had failed and the reasons for the failure pointed out. Throughout the book the illustrations, which are largely colored, seem to have been prepared with great care and fidelity to the original photographs and exhibits that form a division in the museum of the Royal University, Institute for Legalized Medicine at Vienna. The book is of particular value to the physicians of large electrical companies and of others to whom falls the treatment of severe electrical burns. The suggestions given for the thorough protection and insulation of high-tension circuits are of general interest to electrical men who can read German.

"Electric Railway Troubles and How to Find Them." By Paul E. Lowe. Frederick J. Drake, Chicago, Ill. Cloth, 367 pages (5x7½ inches), illustrated. Supplied by the Electrical Review and Western Electrician for $1.50.

This book should prove beneficial to electric-railway operatives and particularly so, to motormen, who wish to master the intricacies of the machinery to which they are entrusted. The motorman should not only be capable of operating his car over a certain route, with all of its apparatus in good working order, but he should be capable to cope with the many emergencies liable to arise in the operation of an electric car. The author has had this in view in compiling a treatise on the best results deduced from the exercise of judgment and experience in the operating and repair of electric-railway apparatus. This applies especially to motors, and the author has treated this subject quite extensively, although a large space of this work is devoted to air-brake apparatus, and car-heating and car-lighting.

"Elementary Electrical Calculations." By T. O'Conor Sloane. D. Van Nostrand Company, New York, N. Y. Cloth, 304 pages (5x8 inches). Supplied by the Electrical Review and Western Electrician for $2.00.

This book is designed to give in simple form what may be termed a foundation for the study of electrical calculations. The operations described require only an elementary knowledge of mathematics. Very few calculations call for the use of algebra higher than that involved in the treatment of Ohm's law, and the arithmetic employed is simpler than that used in commercial calculations. In the solution of networks, where more advanced algebra is required, the matter is placed toward the end. In the appendix some illustrations of geometric, of more involved algebraic, and of simple calculus solutions and demonstrations are given, which should interest those with some knowledge of higher mathematics. For students in electrical engineering this work should prove valuable.

American Street Railway Investments. New York: McGraw Publishing Company. 1909. 498 pages (9½x12¾ inches) with 42 maps. Price $5.00.

The sixteenth annual edition of the "Red Book" on electric-railway investments contains detailed information concerning about 2,300 electric-railway corporations for the use of bankers, capitalists and other smaller investors in their securities. This information in the 1909 volume is compiled in the same manner as has become standard in the recent editions and contains details relative to the charters and franchises, extent of system, subsidiary companies, capital stock and other securities, plant and equipment, officers and directors, as well as in many cases comparative statistics of operation and balance sheet for several years. There

is also given a table of gross receipts for 1907 and 1908 of companies whose annual gross receipts were over $25,000. Besides American companies, reports are given of companies in Canada, Cuba and other of the West Indies, Hawaii and the Philippine Islands. There are also included lists of the national and state railroad commissioners, and of street and interurban railway associations. Inasmuch as this book gives data on a great many companies that are not street-railway companies, and this number is steadily increasing, a more appropriate title for it would be "American Electric Railway Investments."

Lighting in Exchange for Advertising.

The proposed plan for lighting the streets of the downtown business district of Indianapolis, Ind., adopted by the city a few weeks ago has been abandoned in favor of the scheme offered by the Peacock-Wooley Company, of Chicago, for lighting the streets free of cost, or in consideration of the privilege to conduct an advertising business on the lamps. The sample lamp installed by that company is giving excellent satisfaction and attracting considerable attention. The change, it is stated, will mean a saving of $10,000 a year to the city. The contract will provide for ten lights to the square. This should give excellent service.

American Monorail Company.

Bion L. Burrows, former secretary to the New York Rapid Transit Commission, and now president of the American Monorail Company, has announced that he will begin the construction of his monorail line through Pelham Park, connecting with City Island, early in the fall.

Permission has been granted the company by the authorities of Pelham Park to run through the park, instead of the highway, thus giving the cars an unobstructed headway; and it is asserted by the Public Service Commission's engineers who saw the cars operated at the Jamestown Exposition, that a speed of 135 miles an hour will be attained at this point.

If the road at Pelham Park meets with the approval of the public, an application will be made for permission to double-deck both the Second and Third Avenue elevated lines, and operate the monorail system on the upper tracks.

A considerable improvement on the existing service is expected.

Electrical Exports for June and for the Past Fiscal Year.

The Bureau of Statistics of the United States Department of Commerce and Labor has completed its compilation of imports and exports from and to the United States for the month of June, and, therefore, for the fiscal year ended June 30, 1909. From these statistics the tables of electrical exports given below have been taken.

Electrical appliances are classified under instruments and apparatus for scientific purposes and include telegraph and telephone instruments. Electrical machinery is classed under iron and steel, and manufactures thereof. The ups and downs by months of the past fiscal year are clearly shown by the following table:

Month.	Electrical Appliances.	Electrical Machinery.	Total Electrical Exports.
June, 1908	$421,732	$659,497	$1,081,229
July, 1908	429,080	523,355	952,435
August, 1908	437,690	663,468	1,101,158
September, 1908	430,785	568,525	999,310
October, 1908	432,907	543,188	976,095
November, 1908	463,588	295,915	759,503
December, 1908	611,611	587,559	1,199,170
January, 1909	500,309	452,851	953,160
February, 1909	462,856	598,736	1,061,592
March, 1909	681,083	579,499	1,260,582
April, 1909	490,483	489,026	979,509
May, 1909	539,424	479,951	1,019,375
June, 1909	595,044	667,453	1,262,497

For the fiscal years, 1907, 1908, and 1909, ending with June 30 in each case, the totals were:

Year.	Electrical Appliances.	Electrical Machinery.	Electrical Exports.
1906-07	$8,262,640	$9,005,766	$17,268,406
1907-08	6,754,217	8,495,219	15,249,436
1908-09	6,074,865	6,449,526	12,524,391

Referring back to the detailed figures for the month of June, 1909, a list of the principal countries to which electrical products were sent and the value of these exports is given below:

Exported to—	Electrical Appliances.	Electrical Machinery.
United Kingdom	$42,553	$ 68,890
Belgium	8,299	.....
France	2,400	10,974
Germany	7,422	5,661
Other Europe	6,623	13,064
British North America	207,732	56,890
Central American states and British Honduras	22,424	4,688
Mexico	69,207	67,584
Cuba	20,222	970
Other West Indies and Bermuda	10,242	3,051
Argentina	16,064	13,223
Brazil	87,438	45,080
Other South America	22,873	9,603
Chinese Empire	.....	3,740
British East Indies	.....	2,213
Japan	33,853	291,148
British Australasia	7,583	20,931
Philippine Islands	22,504	21,421
British Africa	1,586	16,838

Wireless Telegraphy and Ship Insurance.

At the forthcoming International Conference of Underwriters at Baden-Baden, Germany, next month, the question will be taken up as to whether the insurance premium on a ship should be lowered when the vessel is fitted with a wireless-telegraphy installation.

The Central Electric Railway Association.

The Central Electric Railway Association, which holds meetings once every two months, will have its next regular meeting at the Cadillac Hotel, Detroit, Mich., August 26 next. This is the first meeting of the association in Detroit, and it is intended that it be made the "banner" meeting of the year.

The programme is as follows: 10 a. m.: Business session and reports of special committees. 10:30 a. m.: "The Growth and Development of Express Business on Interurban Lines," paper by J. H. Crall, of the Indianapolis & Eastern Traction Company. 11:15 a. m.: "Application of Recording Wattmeters on Electric Cars," paper by Thos. H. Henkle, representing the Electric Service Supplies Company. 12:15 p. m.: Adjournment for lunch.—Afternoon Session —1:30 p. m.: "The Development of Long-Distance Passenger and Freight Business," paper by F. D. Norveil, of the Indiana Union Traction Company, Anderson, Ind. 2:15 p. m.: "New Things for the Benefit of Our Members."

The following are the officers for 1909: President, A. A. Anderson, general manager of the Indianapolis, Columbus & Southern Traction Company, Columbus, Ind.; first vice-president, George Whysall, general manager of the Columbus, Delaware & Marion Railway Company, Marion, Ohio; second vice-president, A. W. Brady, president of the Indiana Union Traction Company, Anderson, Ind.; secretary-treasurer, A. L. Neereamer, 306 Traction Terminal Building, Indianapolis, Ind.

Members are invited to bring their friends to this meeting.

New Subway Finance Plan.

The New York Public Service Commission has set down September 8 as a day for a hearing on the question whether an extension of the elevated structure to the proposed Eastern Parkway in Brooklyn shall be erected on the assessment plan, provided in the Travis-Robinson amendment to the Rapid Transit Act.

This is the first matter to come up involving the construction of rapid-transit facilities to the plan of assessing the cost on the property benefited.

The route is one asked for by substantially all the property owners in the neighborhood, and is laid out as an extension of the old Route 12, as projected by the Rapid Transit Commission.

PRINTING-PRESS DATA FOR ELECTRIC-MOTOR SALESMEN AND ENGINEERS.

BY S. H. SHARPSTEEN.

Motor salesmen and electrical contractors have difficulty in getting reliable data in relation to the horsepower required to drive the different makes of cylinder or flat-bed printing presses.

People inexperienced in printing-press drive and control will sometimes get the motor or motors very much too large for the work to be done, even after making a careful search, thus making the expense of the equipment and space taken excessive. There are cases where the motors installed are too small, thus causing undue depreciation.

If some printing-press builders are asked the proper motor capacity to operate certain presses that they build, the selling department will advise using a motor very much too small, another printing-press manufacturer will almost insist on having a motor fifty per cent too large.

The accompanying tables have been made up from data carefully selected from reliable sources.

The printing-press manufacturers usually think and talk of their machines by the numbers and bed sizes. These appear in the first and second columns. The printer reasons in bed sizes and impressions per hour, but the motor speeds are given in revolutions per minute, which makes it difficult for the motor salesman to get out his propositions. The third column gives the revolutions of the main shafts of each press to one impression.

If a printer wants a motor drive and control for a No. 8 Cottrell two-revolution press and claims that the maximum impressions per hour will be 1,600, multiply the 1,600 impressions by the 9 in in the third colum, since there are nine revolutions to one impression, and divide by sixty, and the result will be 240 revolutions of the main shaft of the press per minute.

This maximum number of impressions is given as 296 in the fifth column, but it is advisable to consult the printer as to the maximum and minimum impressions, as the character of the work to be done often influences the speed of production of the press.

Especially where a plant is to be changed over from shafting to motor drive the tables give information that will save much correspondence and time.

Type of Press.	Press Number.	Size of Bed.	Rev. Per Impress.	Revolutions Per Minute of Flywheel Shaft. Manufacturer's Specified Speed. Min.	Manufacturer's Specified Speed. Max.	Recommended Speed, General Work. Min.	Recommended Speed, General Work. Max.	Press Pulley.	Horsepower.	Further Press Particulars.
POTTER PRESSES.	0	21x27	5	117	233	135	215	.....	1	Two Roll, Drum Cyl.
	1	24x30	5	111	222	128	205	.....	1	Two Roll, Drum Cyl.
	2	25x35	5	105	210	121	195	.....	2	Two Roll, Drum Cyl.
	2½	29x42	5	105	210	121	195	.....	2	Two Roll, Drum Cyl.
	3	32x46	5	99	198	115	185	.....	2½	Two Roll, Drum Cyl.
	4	34x50	5	99	198	115	185	.....	2½	Two Roll, Drum Cyl.
	3	32x46	5	99	198	115	185	.....	2	Two Roll, 2 Rev.
	4	34x50	5	99	198	115	185	.....	2	Two Roll, 2 Rev.
	5	36x52	5	94	187	108	173	.....	2½	Two Roll, 2 Rev.
	6	40x54	5	94	187	108	173	.....	2½	Two Roll, 2 Rev.
	7	42x60	5	88	175	102	164	.....	3	Two Roll, 2 Rev.
	3	32x46	5	94	187	108	173	.....	2½	Four Roll, Two Rev.
	4	34x50	5	94	187	108	173	.....	2½	Four Roll, Two Rev.
	5	36x52	5	88	175	102	164	.....	3	Four Roll, Two Rev.
	6	40x54	5	82	163	95	150	.....	3	Four Roll, Two Rev.
	7	42x60	5	79	158	91	146	.....	3	Four Roll, Two Rev.
	8	44x60	5	79	158	91	146	.....	4	Four Roll, Two Rev.
	2	24x34	5.5	77	154	89	143	.....	3	Lithograph.
	3	30x44	6.125	79	157	90	145	.....	3	Lithograph.
	4	33x48	6	70	140	81	130	.....	4	Lithograph.
	5	38x58	9.33	98	196	113	182	.....	4	Lithograph.
MIEHLE PRESSES.	00000	.....	12	170	340	195	315	24	5	4 Roller, 2 Rev.
	0000	.....	12	170	340	195	315	24	5	4 Roller, 2 Rev.
	00	.....	12	146	360	195	315	18	4	4 Roller, 2 Rev.
	1	.....	12	180	380	215	345	18	3½	4 Roller, 2 Rev.
	2	.....	12	200	400	230	370	18	3	4 Roller, 2 Rev.
	3	.....	12	200	420	238	382	18	3	4 Roller, 2 Rev.
	4	.....	12	225	440	255	410	16	2½	4 Roller, 2 Rev.
	5	.....	7	150	268	160	256	16	2	4 Roller, 2 Rev.
WHITLOCK PRESSES.	000 E	45x62	5	75	125	78	125	24x6	5	2 Revolution.
	00 E	43x56	5	80	133	83	133	24x6	4	2 Revolution.
	0 E	39x52	5	90	154	96	154	26x6	4	2 Revolution.
	1 E	35x47	4.9	100	169	105	169	26x6	3½	2 Revolution.
	2 E	29x42	5	110	184	115	184	26x5	3¼	2 Revolution.
	3 E	27x40	5	130	220	137	220	26x5	3	2 Revolution.
	5 E	27x31	5	150	255	160	255	26x5	3	2 Revolution.
	01 E	39x52	4.9	100	169	105	169	26x6	4	2 Revolution.
	GU	41x52	12.27	190	368	215	350	20x6	4	2 Revolutions.
COTTRELL PRESSES.	3	27 x39	7	128	245	144	230	28x5	3	4 Roller, 2 Rev.
	5	33½x46	8	147	267	159	255	28x5	3½	4 Roller, 2 Rev.
	6	33½x50	8	147	267	159	255	28x5	4	4 Roller, 2 Rev.
	8	39 x55	9	150	278	165	265	28x5	4	4 Roller, 2 Rev.
	9	43 x56	9.6	160	296	175	280	28x5½	4½	4 Roller, 2 Rev.
	10	43 x62	9.6	160	288	172	275	28x5½	5	4 Roller, 2 Rev.
	12	47 x65	10.2	136	260	153	245	28x5½	6	4 Roller, 2 Rev.
	13	50 x74	10.2	136	265	155	250	28x5½	6½	3 Roller, 2 Rev.
	5	33 7/8x45	5.85	87	170	100	160	28x6	6	Flat Bed, Perfecting.
	8	39¾x54	6.57	76	148	86	138	28x7	7	Flat Bed, Perfecting.
	9	43 x62	6.86	80	154	90	144	28x7	7½	Flat Bed, Perfecting.
	10	44¾x63	7	76	146	85	136	28x8	7½	Flat Bed, Perfecting.
BABCOCK PRESSES.	3[2]	26 x32	5.68	148	284	165	265	24	2	Optimus, 4 Roller.
	4[2]	27 x39	6	140	270	158	255	24	2	Optimus, 4 Roller.
	4[3]	28 x41	6	130	250	145	235	27	2	Optimus, 4 Roller.
	5[4]	30 x43	7.5	160	300	178	285	28	3	Optimus, 4 Roller.
	6[4]	32 x47	8	140	280	160	260	32	3	Optimus, 4 Roller.
	7[4]	36 x52	9	148	284	165	265	32	4	Optimus, 4 Roller.
	8[4]	39 x53	9.6	150	288	168	270	32	5	Outimus, 4 Roller.
	9[4]	39 x55	9.6	150	288	168	270	32	5	Optimus, 4 Roller.
	10[4]	41 x55	9.9	148	284	165	265	32	5	Optimus, 4 Roller.
	11[4]	43 x63	10	135	267	155	250	32	6	Optimus, 4 Roller.
	12[4]	47 x66	10.57	135	264	155	250	32	6	Optimus, 4 Roller.
	2	22 x27	5	110	208	120	195	15	1	Standard, 2 Roller.
	4	27¾x40	5	100	184	110	175	18	1½	Standard, 2 Roller.
	6	33½x48	5	80	150	87	140	19	2	Standard, 2 Roller.
	7	38 x51	5	75	142	85	135	19	2½	Standard, 2 Roller.
	2	22 x27	5	110	208	120	195	15	1	Regular, 2 Roller.
	4	27¾x40	5	100	184	110	175	18	1½	Regular, 2 Roller.
	6	33½x48	5	80	150	87	140	19	2	Regular, 2 Roller.
	7	38 x51	5	75	142	85	135	19	2½	Regular, 2 Roller.
	3	24 x31	3	90	180	105	168	18	1½	Express.
	7	38 x51	7½	175	325	195	310	25	4	Express.
	6	29 x43	3	75	150	87	140	22	4	Dispatch.
	7	39 x52	3	70	140	81	130	22	5	Dispatch.
	8	43 x57	3	60	120	70	112	22	6	Dispatch.
HUBER-HODGMAN PRESSES.	000	52 x70	12	160	300	178	285	24x6½	6	4 Roller, 2 Rev.
	00	49 x66	12	160	320	184	295	24x6½	5½	4 Roller, 2 Rev.
	0	46½x62	12	170	340	195	315	24x6½	5	4 Roller, 2 Rev.
	1	46½x56	12	170	340	195	315	24x6½	5	4 Roller, 2 Rev.
	2	42 x52	9	135	270	155	250	24x5½	4	4 Roller, 2 Rev.
	3	38 x48	9	135	278	155	250	24x5½	3	4 Roller, 2 Rev.
	4	31 x43	7½	125	262	150	240	24x4½	3	4 Roller, 2 Rev.
	5	28 x33	7½	138	275	160	256	24x4½	2	4 Roller, 2 Rev.
	0	46½x62	12	160	250	160	250	30x6½	8	4 Roller, 2 Color.
	2	40 x52	12	180	300	187	300	26x6½	6	4 Roller, 2 Color.
SCOTT PRESSES.	C-1	17 x22	4	93	186	107	172	14x4	1½	Two Roll, Drum Cyl.
	C-5	38 x51	5	84	167	97	155	17x5	2	Two Roll, Drum Cyl.
	C-6	33½x47	5	75	150	87	140	17x5½	2½	Two Roll, Drum Cyl.
	C-7	30 x42	5	67	133	78	125	20x5½	3	Two Roll, Drum Cyl.
	D or DT-3	24 x29	5.09	102	204	118	189	15x4	2	Two Roll, Drum Cyl.
	D or DT-4	26 x34	5	92	183	106	170	17x4½	2½	Two Roll, Drum Cyl.

The salesman who has spent days in a hot print shop getting speed data will realize the importance of having the revolutions per impression given in the tables, together with the press pulley sizes and required motor sizes.

Interurban Traffic in Indiana.

Public feeling over the numerous recent collisions and wrecks on the interurban roads of Indiana prompted the Railroad Commission to call a meeting of the committee on rules last week and suggest a revision of certain rules. The members who responded to the call were: H. A. Nichols, general manager of the Indiana Union Traction Company; F. M. Durban, general manager, Evansville & Southern Indiana Traction Company; C. K. Jefferries, district manager of the Terre Haute, Indianapolis & Eastern Traction Company, and A. A. Andersen, general manager, Indianapolis, Columbus & Southern Traction Company.

The commissioners were inclined to criticize the Indiana Union Traction Company for attempting to run cars on a fixed schedule in the absence of train orders, in direct violation of Rule 162. Mr. Nichols said that during a sleet storm in January their telephone wires were all down and they could not receive train orders for four days. They operated on schedule time, otherwise the entire system would have been tied up. This rule was modified. Rule 134 was amended so as to require conductors to leave a car from the rear platform, and before doing so securely fasten the rear vestibule door on the opposite side from which he leaves to flag the crossing and not give signal to motorman to proceed until after he is positive no one is attempting to board or leave the car.

Rules 82, 162, 151 and 269 were revised in a way deemed advisable to make operation of trains more safe.

The commission suggested that Rule 151 B be so amended as to make it imperative for both the conductor and the motorman to receive the train orders over the telephone and that the dispatcher recognize the different voices of the train crew. The commissioners believe if this plan had been required at least two of the recent wrecks due to men failing to observe orders would not have occurred. The committee will take this suggestion up at its next meeting. The commission is determined that interurban travel in Indiana shall be made safer and the responsibility placed on the general managers to make it so. S.

Type of Press.	Press Number.	Size of Bed.	Rev. Per Impress.	Revolutions Per Minute of Flywheel Shaft. Manufacturer's Specified Speed. Min.	Manufacturer's Specified Speed. Max.	Recommended Speed, General Work. Min.	Recommended Speed, General Work. Max.	Press Pulley.	Horse-power.	Further Press Particulars.
SCOTT PRESSES—Continued.	D or DT-5	29 x42	5.07	85	169	97	155	20x5	2½	Two Roll, Drum Cyl.
	D or DT-6	32 x47	4.96	75	149	86	138	22x5½	3	Two Roll, Drum Cyl.
	D or DT-7	35 x51	5.06	68	135	78	125	22x5½	3½	Two Roll, Drum Cyl.
	E-2	21½x25	6	180	360	208	332	16x4	2	Two Roll, Drum Cyl.
	E-3	24½x31	6.52	174	347	200	325	16x4	2½	Two Roll, Drum Cyl.
	E-4	27½x36	7.56	180	359	208	332	18x5	3	Two Roll, Drum Cyl.
	E-5	30½x42	8.08	175	350	202	325	18x5	3½	Two Roll, Drum Cyl.
	HN or HF-4	26 x36	7.4	160	320	184	296	18x5½	3	Four Roll, 2 Rev.
	HN or HF-5	29 x42	7.8	156	312	180	290	18x5½	3½	Four Roll, 2 Rev.
	HN or HF-6	33½x46	8.06	148	295	170	274	22x6½	4	Four Roll, 2 Rev.
	HN or HF-7	36½x48	8.43	148	295	170	274	22x6½	4½	Four Roll, 2 Rev.
	HN or HF-8	40 x52	8.81	147	293	170	274	22x6½	5	Four Roll, 2 Rev.
	HN or HF-9	43½x56	9.37	148	296	170	274	24x7½	5½	Four Roll, 2 Rev.
	HN orHF-10	47 x62	9.75	146	292	170	274	24x7½	6	Four Roll, 2 Rev.
	HN orHF-11	48½x66	9.75	138	276	160	255	24x7½	6	Four Roll, 2 Rev.
	M-2	38 x51	5.33	147	293	170	274	24x5	5	Rotary, 2 Rev.
	M-3	46 x60	5.66	142	283	163	262	24x6	6	Rotary, 2 Rev.
	M-4	46 x70	5.66	142	283	163	262	24x6	6½	Rotary, 2 Rev.

Possible Opportunities in Mexico.

Concerning electric power in Guadalajara, Mexico, and the ordering of all wires to be placed underground, United States Consul Samuel E. Magill reports as follows:

The placing underground of all wires in this city will be accomplished by the union of two strong local corporations—La Compania de Tranvias, Luz y Fuerza de Guadalajara, with La Empresa Irrigadora y de Produccion Electrica de Guadalajara. The former corporation now has a monopoly of the electric power and lighting of this city, and the latter corporation has valuable concessions from the state of Jalisco and the government of Mexico, through which it controls rights to irrigate a large tract of land in this state and immense waterpower in nearby rivers, and also to enter Guadalajara with its wires to compete with the former in selling light and power in the city. This will prevent a possibly dangerous competition and will certainly result in benefit to Guadalajara, although prices will probably be kept up to the present standard.

Just what opening this change will offer to American manufacturers is at present uncertain, as while the Compania de Tranvias has heretofore purchased American-made electric machinery, the Compania Irrigadora is said to have made a contract with a large German concern to use German goods exclusively in return for financial aid given by the German company about a year ago, at a time when it was difficult to interest American capitalists in Mexican enterprises.

Offerings of materials for the conduits and for the trolley underground addressed to either of the above companies will no doubt receive consideration, and may result in business.

American Telephone and Telegraph Takes Over Central District.

The Central District and Printing Telegraph Company, which operates all the Bell lines in Western Pennsylvania, Eastern Ohio, and a part of West Virginia, has been taken over by the American Telephone and Telegraph Company. The deal involves about $13,000,000. The deal was brought about by the acceptance of the proposal of the American Telephone and Telegraph Company to exchange its stock for the stock of the Central District and Printing Telegraph Company on the basis of one share of the former for one-and-one-half shares of the latter.

Much of the stock of the Central District and Printing Telegraph Company has been delivered to the treasurer of the American Telephone and Telegraph Company, and all of it will be in his hands by August 31.

Forty-second Street Road to be Sold.

Judge Lacombe, in the United States Circuit Court at New York, has granted the application of the Union Trust Company for a decree of foreclosure and sale, under the second or income mortage, of the Forty-second Street. Manhattanville & St. Nicholas Avenue Railroad Company, of New York city, and others. At the final hearing held there was no opposition to the application.

To Harness Hell Gate.

Experiments are under way to determine the feasibility of utilizing the powerful currents which daily swirl through Hell Gate, off the port of New York. Secret testing operations are being performed in an attempt to discover a method of changing the force of the tides at this point into electric power. The backers of the project are not known.

Wireless Service Extended.

The Netherland Chamber of Commerce in America, 136 Water Street, New York city, announces that it has received a communication from the governor of the Colony of Curaçao, Dutch West Indies, containing the information that the wireless telegraph station at the port of Willemstad, Island of Curaçao, has been opened for the public, and the following rates will be charged:

From 1 to 10 words, 40 cents; for every additional word, 4 cents; delivery of message in Willemstad, 10 cents; delivery on board of a vessel not moored alongside the quay of Willemstad, 20 cents.

These charges are collected from the sender or receiver of the message on land, while the ship rates charged on board of the vessel are paid by the sender or receiver on board.

Messages from vessels to the land station, destined to be forwarded by submarine cables, will be delivered to the agent in Willemstad of the steamship company owning the vessel sending the message and who will have to take charge of the forwarding to destination of such message.

The station will be open on week days from 5 a. m. until 7 p. m. and at 12 midnight. On Sundays and holidays, from 5 a. m. till 6 a. m.; at 12 noon; from 6 p. m. till 7 p. m.; and at 12 o'clock midnight.

The nominal distance which the land station can reach is 500 kilometres, but no difficulty has been experienced in sending or receiving messages at a distance of 800 kilometres.

$50,000,000 Steel Plant Planned for Mexico City.

A gigantic steel plant will be established in Mexico City within the coming year by French and American capital. The initial outlay will be $50,000,000. Victor Belanger, of Paris, is the head of the concern. It is understood that a large part of the capital will come from Paris and Boston. Coal and iron mines in Mexico will be acquired later by the company. It is reported that the steel will be manufactured by a new and secret process.

Copper Exports.

Exports of copper for the week ended August 5 were 6,604 tons. Since August 1, they were 5,377 tons compared with 6,132 tons the same period last year.

Indiana State's Attorney Objects to Electric Signs.

Every overhanging sign in South Bend, Ind., must come down, according to State's Attorney C. E. Pattee. His edict includes electric signs, illuminated arches and all devices extending over the sidewalk, representing an expenditure in that city of over $20,000.

Prosecutor Pattee announced his crusade when he filed an affidavit against John Platt and Richard Perkey, proprietors of a clothing store in South Bend. Mr. Pattee said that every overhanging sign in the business district of South Bend is a violation of the state law. He declared them to be dangerous to the public.

Increase in Electric Pumping Plants.

In connection with the decision of the Providence, R. I., city officials to install electric pumps at the city water supply stations, they were informed as to the great increase in the use of electric motors for this purpose. In this case power is to be furnished from a central station, that of the Narragansett Electric Lighting Company. The fact was brought out that many other cities, Duluth, Minn., in particular, was instanced, are doing away with a steam equipment for water service and are operating their pumping plants by electricity.

The Narragansett Electric Lighting Company has estimated that it could install a motor for the operation of a turbine of the 10,000,000 gallons per diem capacity required by the conditions for about $10,000, which could be operated by electric current at a very low cost to the city. This, the company stated, would effect a saving of $30,000 to the city of Providence.

Mackay Companies' Plans.

The new cable which the Commercial Cable Company has laid between New York and Newfoundland will be duplicated in the near future. The Commercial Cable Company finds that it must have a second cable by this new route or else lay a new cable over the entire distance to England if the present volume of business is to be properly handled.

This means that two out of the present five Atlantic cables are to have direct Newfoundland connection with New York, with a gain in speed of transmission of fully thirty-five per cent, and as great a probable increase in accuracy of transmission.

Urges Subway Construction.

Samuel Rea, second vice-president of the Pennsylvania Railroad and president of the Pennsylvania Terminal Company, which is building the new station at Seventh Avenue and Thirty-third Street, New York city, and the series of tunnels from Jersey to Long Island, has sent to the Public Service Commission a letter urging the immediate approval and construction of the proposed Seventh Avenue subway. Mr. Rea's communication places great emphasis on the fact that the new Pennsylvania terminal will be opened to the public next year and declares that the city should appreciate the necessity of subway connections with it.

Boston & Maine to Use Waterpower.

By a deed recorded in Concord, N. H., Alvah W. Sulloway, of Franklin, conveys to the Boston & Maine Railroad the waterpower and privilege and electric plant recently purchased by him at Eastman Falls, on the Pemigewassett River. The transaction includes also undeveloped waterpower in the same river in the towns of Bristol, Hill, New Hampton and Sanbornton.

Boston & Maine officials state that plans have not been definitely made, but that the railroad company has need of power, inasmuch as it has large shops in the vicinity and also operates trolley lines.

Special Price on Lights.

By a plan agreed upon by the officials of the various lighting companies having in charge the illumination of New York at the coming Hudson-Fulton celebration the most continuously brilliant spectacle ever offered by a community is assured.

The present retail rate for Manhattan current is ten cents a kilowatt-hour. As the New York Edison's contribution to the celebration it has been decided to make the charge for electricity supplied in the territory it serves during the period of festivity five cents per kilowatt-hour. This will necessitate special meters for temporary installation.

Representatives of the New York Edison Company have started out on a systematic canvass among the citizens, looking to a general lighting up, not only of stores and office buildings, but of private dwellings as well. The company will place decorators at the service of all who are disposed to help brighten the city during the Hudson-Fulton times, but don't know just how to go about it.

PRACTICAL ACCOUNTING FOR ELECTRICAL COMPANIES.[1]

IMPORTANCE OF UNIFORMITY IN BOOKKEEPING—CLASSIFICATION OF INCOME ACCOUNTS—A TYPICAL BALANCE SHEET.

BY R. F. PACK.

The subject of accounting for electrical corporations is one that is attracting a considerable amount of attention at the present time. Many of the state governments, through their public-service commissions, have issued orders calling for uniform systems of accounting, and these systems require a very detailed classification of accounts. Moreover, the companies themselves are feeling, instinctively, a growing need for a greater knowledge only to be obtained by a careful and scientific arrangement of income and operating accounts. It is, of course, evident that the public-service commissions require this detailed classification in order to obtain comprehensive reports of the affairs of the companies for the benefit of the public, whose servants they are; but it may be said that this "interference" by the state has benefited the companies as much as, or perhaps more than, it has served the state.

Up to the present, we, in Canada, have not been compelled to make drastic changes in our systems by any process of law, but directors and officers, in charge of our companies, are realizing more and more the advantages to be gained by a more elaborate classification, and should the time arrive when our provincial Legislatures require reports similar to those prescribed by the state governments in the United States, and by the Board of Trade in Great Britain, it would be much to our advantage if we had already decided on a uniform system, and could thus present a united front in meeting any committee, appointed by the provincial government, to discuss and to formulate a definite system.

Furthermore, we stand very much in the position of manufacturers, and no manufacturer today can hope to reap a full measure of financial success unless he has an accurate knowledge of the exact cost of both manufacturing and distributing his commodity. The day is long past when we can charge for our commodity—electric current—"the highest price that the traffic will bear." We have to meet on all sides the keenest competition, and it is now necessary for us to be prepared to supply electric current at the lowest possible price, consistent with financial safety, and this cannot be done unless we have an absolute knowledge of the exact cost of production and distribution.

At the meeting of the National Electric Light Association, held in Chicago in May, 1908, the committee appointed to consider "A Uniform System of Accounting," presented its report. This committee had drawn up a classification of accounts which they wished to have adopted by the National Electric Light Association, in order to strengthen the hands of the electric-light companies in presenting their views to the Public Service Commission, of New York state, and as the system adopted by this commission (to take effect on January 1 last) so closely approximates the system proposed by the National Electric Light Association, it is evident that the companies concerned were able to convince the commission that their classification would give the state all the information it required, and, at the same time, meet the needs of the companies.

The Railroad Commission of the state of Wisconsin has also prescribed a uniform classification of accounts for electric companies, and this system is very similar to that adopted by the state of New York. Other states, through their public-service commissions, have the matter under consideration, and there is little doubt that this system of accounting, having already so wide an application, will extend its field, and that, sooner or later, all companies will be influenced by it.

It must, of course, be understood that it is impossible for all companies, whether large or small, to have an exact uniformity of accounting to the minutest detail, and the aim and object should be to secure uniformity in essentials; in other words, to agree on the basic principles; and then, as local conditions require or permit, to build a superstructure to satisfy the most exacting demands. Assuming that the average income of electrical companies to be $3 per inhabitant, of the territory served, it was estimated that seventy-five per cent of the companies doing business in the United States, earn, on the average, less than $15,000 per annum; similar conditions, no doubt, obtain in Canada, which make it impossible for the smaller companies to carry out a very elaborate system, and the aim of this paper is to suggest those main accounts which can be kept, and which most certainly should be kept, and then to show how each company can provide sub-accounts to satisfy its own requirements.

The form which follows is the foundation upon which every system should be built:

BALANCE SHEET.

Assets—
Property and Plant: Franchises and patent rights. Land. Buildings and fixtures. Power plant equipment. Transmission and transformation system. Storage battery equipment. Distribution system. Utilization equipment. General office and stores equipment. Miscellaneous.
Treasury Securities: Stocks and bonds.
Investments: Stocks and bonds of other companies. Other investments.
Reserve, sinking and special fund assets:
Current Assets: Cash, materials and supplies. Bills receivable. Accounts receivable. Interest and dividends receivable. Other current assets.
Prepaid Accounts: Taxes prepaid. Insurance prepaid. Rents prepaid. Other prepayments.
Open Accounts: Deficit.

Liabilities—
Capital: Capital stock, preferred. Capital stock, common. Funded debt.
Mortgages: Real estate mortgages. Other mortgages.
Current Liabilities: Notes and bills payable. Accounts payable. Consumers' deposits. Sundry current liabilities.
Accrued Liabilities: Insurance accrued. Taxes accrued. Interest on funded debt accrued. Sundry liabilities accrued.
Open Accounts:
Reserves: Amortization reserve. Special and general reserves.
Surplus:

INCOME ACCOUNT.

Operating revenues—		
Commercial lighting earnings	.....	
Commercial power earnings	.....	
Municipal street lighting earnings	.....	
Municipal building lighting earnings	.....	
Miscellaneous earnings from operation	.....	
Total operating revenues		.....
Operating expenses—		
Generation expense	.....	
Transmission and transformation expenses	.....	
Storage expense	.....	
Distribution expense	.....	
Utilization expense	.....	
Commercial expense	.....	
New business expense	.....	
General expense	.....	
Undistributed charges	.....	
Total operating expenses		.....
Net operating revenue		.....
Non-operating revenues—		
Profit on wiring and sales	.....	
Rents	.....	
Interest receivable	.....	
Total non-operating revenues		.....
Gross income		.....
Deductions—		
Interest on funded debt	.....	
Interest on mortgages	.....	
Interest on floating debt	.....	
Miscellaneous deductions	.....	
Total deductions		.....
Net income		.....
Sundry appropriations	.....	
Stock dividends	.....	
		.....
Surplus		.....

As a guide to the main expense account, it may be said that:
Generation includes—Cost of electric current delivered to station terminal board.
Transmission and transformation includes—Cost of conducting current to substations and cost of transforming and making ready for delivery to distribution system.
Storage includes—Cost of storage battery.
Distribution includes—Cost of conducting current from substation terminal boards to customers' premises.
Utilization includes—The trimming and inspection of lamps, customers' premises expenses, lamp renewals and the like.
Commercial expenses include—Cost of reading meters and all office expenses in connection with consumers' accounts.
New business expense includes—Cost of securing new business.
General expense includes—Administration and miscellaneous general expenses.

We have here the skeleton only of a good system of accounting, and there are but few companies that will not require a more detailed classification; it must be borne in mind, however, that the details, no matter how numerous, must be treated as sub-accounts of the

[1] Paper read before the Canadian Electrical Association, Quebec convention, June 16-18, 1909.

main accounts, and in no case should the general plan be materially altered.

The property and plant accounts may be further divided as follows:

Land—
Occupied by generation stations. Occupied by outside substations. Used for other purposes.

Buildings—
Steam power plant buildings. Hydraulic power plant buildings. Substation buildings and transformer stations. Buildings used for general corporate purposes.

Power Plant Equipment—Furnaces, boilers and accessories:
Steam Plant—Furnaces, boilers and accessories. Steam engines. Gas Plant—Gas producers and accessories. Gas engines. Hydraulic Plant—Dams, canals and pipe lines. Turbines and water wheels. Miscellaneous power plant equipment. Electric generators. Accessory electric power equipment.

Transmission and Transformation System—
Transmission overhead system. Transmission underground system. Substation and transformer station equipment.

Storage Battery Equipment—

Distribution System—
Overhead distribution system. Underground distribution system. Line transformers and devices. Services. Meters. Municipal street lighting system.

Utilization Equipment—
Commercial lamps and equipment. Municipal lamps and equipment. General utility equipment.

General Offices and Stores Equipment—

Miscellaneous—
Electrical tools and implements. Electrical laboratory equipment. Stable equipment. Miscellaneous charges during construction.

The revenue accounts cannot be arbitrarily classified. A broad generalization has been suggested, and local conditions must govern a further classification.

The expense accounts should be kept in fuller detail and the following sub-accounts will serve the purposes of the majority of the companies:

Generation Expense—
Operation:
Superintendence.
Boiler labor.
Engine labor.
Electrical labor.
Miscellaneous labor.
Fuel.
Water.
Lubricants.
Miscellaneous supplies and expenses.
Maintenance and repairs:
Boiler equipment.
Steam equipment.
Electric generators.
Accessory electric equipment.
Building and fixtures.
Miscellaneous station equipment.
} Steam power generation.

Corresponding or appropriate accounts.
Electric current purchased.
} Gas power generation or hydraulic power generation.

Transmission and Transformation Expense—
Operation—Inspecting and patroling transmission system. Substation labor. Substation supplies and expenses. Maintenance and Repairs—Transmission line. Substation buildings. Substation equipment.

Storage Expense—
Operation—Labor. Supplies. Maintenance and Repairs—Batteries. Accessories.

Distribution Expense—
Operation—Superintendence. Distribution office expenses. Setting and removing meters and transformers. Connecting and disconnecting services. Meter testing and inspecting. Meter department supplies and expenses. Miscellaneous labor and expenses.
Maintenance and Repairs—Overhead system. Underground system. Services. Line transformers. Meters.

Utilization Expense—
Operation—Trimming and inspecting lamps. Lamp supplies. Incandescent lamp renewals. Miscellaneous supplies and expenses. Consumers' premises expenses.
Maintenance and Repairs—Lamps. Consumers' installations. (Sub-accounts should be kept separating commercial and municipal expenses.)

Commercial Expense—
Reading meters—salaries and expenses. Collection department—salaries and expenses. Customers' department—accounting, salaries and expenses. Miscellaneous supplies and expenses.

New Business Expense—
Salaries. Canvassing and soliciting. Advertising. Demonstrations. Supplies and expenses.

General Expense—
Salaries and expenses of general officers. Salaries and expenses of general office clerks. General office—supplies and expenses. General law expenses. Miscellaneous general expenses. Maintenance and repairs of general office buildings and fixtures. Maintenance and repairs of general office equipment.

Undistributed Charges—
Insurance. Juries and damages. Store expenses. Stable expenses. Taxes. Uncollectable bills. General amortization.

The remaining accounts, having to do with deductions from income, such as interest on funded debt, and miscellaneous appropriations to reserve accounts, etc., are self-explanatory, and can be classified to suit varying conditions.

It is manifestly impossible to satisfy every requirement of every electrical company; the aim has been to give, as briefly as possible, a general outline of the main features of a system of accounting that could be made, more or less, uniform in Canada, and the companies themselves must remedy deficiencies, and supply additions, to suit their own requirements, as it will be readily understood that a very lengthy paper would have to be written to set forth a system comprehensive enough to suit all conditions.

In regard to depreciation, or amortization, of property and plant, it is advisable that a certain amount be charged, month by month, to operating expenses through a general amortization account, the amount so charged to be credited to an amortization reserve account, and to be sufficiently large enough to cover the ordinary wear and tear, and obsolescence, that have taken place during the month, in the property and plant of the company (less the amounts charged to the various repair accounts in the operating expenses), and to provide a reserve, estimated to be sufficient to cover the cost of property destroyed by extraordinary casualties. At the end of the fiscal year a proper amount should be written off the various property and plant accounts to cover ordinary depreciation and extraordinary casualties, the total of the amounts thus written off being charged to the amortization reserve account.

Great care should be taken to identify all additions made to the property and plant accounts, and it should be possible at the end of each month to state, with much particularity, the exact nature and extent of the additions, or betterments, made to the plant, and to point to the exact cost of such addition, or betterment in the appropriate property and plant account. For this purpose the "Work Order" system is strongly recommended; by means of this system an order, having a serial number, is given for each item of work required to improve, or to add to, the property of the company, and all material and labor used for this work is charged to this particular work order, and the total amount so charged on the completed work order can be entered in the appropriate property and plant account, with a description of the work done, thus giving a ready means of identification.

It is obvious that the accounting records, by themselves, have only a limited value, and they must be studied in conjunction with the data supplied by the engineering department in order that their greatest usefulness may be realized. To mention this phase of the subject is probably sufficient, and common sense will suggest the many ways in which the engineering records may be analyzed, and used, with the figures provided by a scientific system of accounting.

There is little doubt that the electrical companies of the Dominion will be compelled in the near future, by force of circumstances, to adopt a classification of accounts affording the maximum of analysis, requiring work of a very high character on the part of the accountants.

Artistic Possibilities of Electricity.

Under the above caption and in a quite gracefully written article appearing in the August number of the *Fine Arts Journal*, published in Chicago, the various uses of electricity in refined homes are discussed and beautifully illustrated. The Commonwealth Edison Company's artistic and now famous "Electric Shop" is described at full length as affording the best possible example of the artistic possibilities of electricity in this direction. The comely and charming young miss or matron is shown dispensing hospitality at breakfast, lunch, or the after-theatre supper in an electric and altogether inviting manner, be it with a toast rack under her hand or the electric chafing-dish beside her.

This "electrical number" of the publication should do quite a lot in stimulating interest in the use of the latest conveniences and appliances of the day, alike in the cozy corners of polite society and in the studios of sophisticated art coteries.

An Electric Dredge.

The first big dredge to be operated entirely by electricity began work last week clearing out Stockton channel, Stockton, Cal., for the United States government. All of the machinery aboard the suction machine will be moved by electricity. The Pacific Gas and Electric Company has the contract for furnishing 600 horsepower from the Standard line, and a special line is being constructed along the south side of Stockton Channel, crossing Mormon Channel under water. An electric power line also is to be constructed soon across the islands to supply the reclamation plants and pumps.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

MASSACHUSETTS STREET RAILWAYS TO ISSUE NEW STOCK.

Several street-railway companies have been authorized by the Massachusetts Railroad Commission to issue new capital. The Boston & Northern and Old Colony Street Railway companies are authorized to issue, respectively, 5,883 and 4,042 shares of preferred stock at $115, to supply working capital, the price of $115 having been fixed by directors in accordance with act of the recent Legislature. The Worcester Street Railway may issue $3,182,000 twenty-year, five per cent bonds, proceeds to refund bonds previously issued for taking over the Worcester & Marlboro, Worcester & Clinton and Leominster & Clinton companies. The Berkshire Street Railway Company is authorized to issue $190,000 bonds to pay floating indebtedness and cost of permanent additions.

JERSEY TRACTION BOND SALE.

The Public Service Corporation of New Jersey will soon take up its outstanding notes, covering this by an issue of bonds amounting to $8,000,000, which will be the first instalment of a $50,000,000 issue authorized by the concern a year ago.

The bonds will be secured by a blanket mortgage and will bear interest at the rate of five per cent. The underwriters are J. Pierpont Morgan & Company of New York city and Drexel & Company of Philadelphia. The Fidelity Trust Company, of Newark, will handle the issue. The bonds, it is said, will be placed on the market at ninety-two-and-one-half.

NASHVILLE RAILWAY AND LIGHT.

The report of the Nashville Railway and Light Company for the month of June and six months ended June 30 compares as follows:

	1909.	1908.
June gross	$143,644	$130,191
Expenses	67,368	61,606
June net	$ 76,276	$ 68,585
Six months gross	826,414	754,343
Expenses	411,574	394,858
Six months net	$414,840	$359,485

AMERICAN CITIES RAILWAYS.

The report of the American Cities Railway and Light Company for six months ended June 30 compares as follows:

	1909.	1908.
Gross	$2,775,747	$2,629,523
Expenses and taxes	1,608,763	1,584,747
Net	$1,165,984	$1,044,776
Interest and sinking fund	637,073	621,067
Six months surplus	$ 529,911	$ 423,709

BIRMINGHAM RAILWAY, LIGHT AND POWER.

The report of the Birmingham Railway, Light and Power Company for the month of June and six months ended June 30 compares as follows:

	1909.	1908.
June gross	$ 175,180	$ 193,767
Expenses	100,757	107,148
June net	$ 74,423	$ 86,619
Six months gross	1,093,296	1,062,046
Expenses	609,906	615,177
Six months net	$ 483,390	$ 446,869

FONDA, JOHNSTOWN & GLOVERSVILLE.

The report of the Fonda, Johnstown & Gloversville Railroad Company for the month of June and twelve months ended June 30 compares as follows:

	1909.	1908.
June gross	$ 69,715	$ 63,622
Expenses	30,683	28,490
June net	$ 39,032	$ 35,132
Twelve months gross	773,849	777,475
Expenses	355,588	379,041
Twelve months net	$418,261	$398,434

CINCINNATI COMPANIES MERGED.

The Columbia Gas and Electric Company has taken over almost forty per cent of the common stock of the Union Gas and Electric Company. The Columbia company was already a holder of about sixty per cent of the stock. It has also obtained enough additional preferred stock to give it sixty per cent of that issue, the deal representing between $7,000,000 and $8,000,000.

NORTHERN ELECTRIC COMPANY.

The report of the Northern Electric Company, of Sacramento, Cal., for the past year shows a gross income of $442,712.27; operating expenses, $356,489.37; profits, $85,252.90; interest, $105,508.70; leaving a deficit of $19,305.80.

COMMONWEALTH EDISON COMPANY.

Earnings of the Commonwealth Edison Company, of Chicago, are understood to be substantially ten per cent greater than one year ago. This growth may be taken as indicative of improved business conditions. But there also is to be considered the fact that the company has pursued a campaign of advertising. By this it is meant that the company has taken steps to bring to the attention in one way and another of possible patrons the uses and benefits of electric current.

The business, in consequence, is beginning to reach such a volume that the company has announced a reduction in the cost of current, beginning with August. In this instance both the advertiser and the consumer appear to have been benefited.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

There has been placed upon the Philadelphia Stock Exchange regular list $605,000 additional capital stock of the American Telephone and Telegraph Company, issued in exchange for $810,000 four per cent convertible bonds of the company, making the total amount of said stock listed at this date $238,617,600, and reducing the amount of said bonds outstanding to $72,058,000.

UNITED RAILROADS.

The earnings of the United Railroads of San Francisco for May have just been made public. The report shows total earnings amounting to $634,169, or $27,745 less than last year for the same month. For the five months ended May 31, the earnings were $2,971,421, as compared with $2,790,260 for the same period last year.

REORGANIZE SECOND AVENUE ROAD.

Stockholders of the Second Avenue Railroad Company, New York city, held a meeting on July 21 and selected a bondholders' committee, consisting of J. W. Castles, president of the Union Trust Company; A. J. Hemphill, secretary of the Guaranty Trust Company; George Amer, Henry S. Redmond and George G. Amer, Jr.

Under the supervision of this committee a plan to reorganize the Second Avenue Railroad Company, which was suggested at the meeting, will be definitely formulated. A majority of the stockholders are said to have expressed their willingness to join in an assessment payment to free the road from the financial difficulties which at present surround it.

May Invest in Electric-Railway Securities.

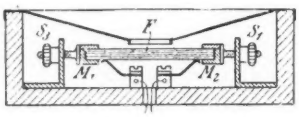
According to the attorney-general of Ohio, insurance companies may invest their capital in first-mortgage bonds of electric railroads. This is the opinion given to State Insurance Commissioner Lemert.

The law says that they may invest in railroad bonds and this is construed to mean electric as well as steam roads.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

CONDENSER TELEPHONE RECEIVER.

It has been known since some years that paper condensers, when operated with high-tension currents, are set into vibration and emit sounds of considerable strength. A number of attempts have been made to utilize this phenomenon in the construction of a telephone receiver, but in all of them a high-tension battery was necessary for the operation of the receiver. Carl Ort and Joseph Rieger have made experiments with "speaking" condensers and have succeeded in transmitting speech intelligibly with pressures of only four to six volts at the condenser. In the original experiments the condenser was charged by current from a dynamo, and the sound vibrations were transmitted



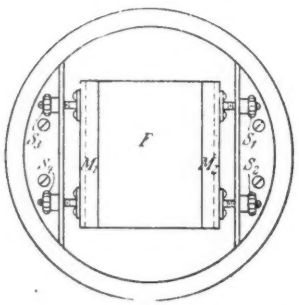


FIG. 1.—CONDENSER TELEPHONE RECEIVER.

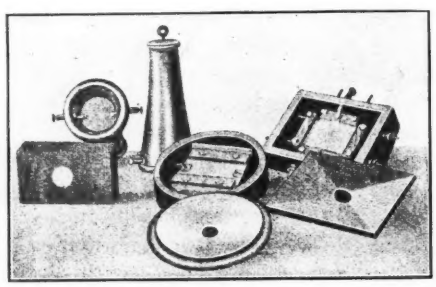


FIG. 2.—CONSTRUCTED CONDENSER TELEPHONE RECEIVER.

to the condenser by a circuit comprising a microphone, a battery and the primary of a telephone transformer, the secondary of the latter being contained in the dynamo circuit. It was found that the condenser did not speak clearly with a low tension—ten to twenty volts. This led to a special construction of the condenser, namely, a mechanical stretching of the condenser sheets, which made the employment of lower tensions possible. The edges of the loose sheets vibrate very irregularly and render the sounds unintelligible. Fig. 1 shows the telephone receiver in section, and Fig. 2 represents a number of these receivers as constructed. The condenser sheets are clamped in two devices M_1 M_2, and uniformly stretched by means of screws S_1 S_2. In many cases paper may be entirely dispensed with, a coat of shellac on the foil taking its place. In the circuit arrangement shown in Fig. 3 each of the condensers C_1 C_2 is connected to a battery of two to three cells contained in the microphone circuit, so that no special battery is required for the condenser. This arrangement was tested on a line eight kilometres in length with

FIG. 3.—CIRCUIT CONNECTIONS FOR CONDENSER TELEPHONE RECEIVER.

perfectly satisfactory results. In order to make the transmitted sounds louder the condenser is charged to a higher pressure (about twenty volts), and in order to produce sounds that are audible throughout a large room a condenser tension of about 100 volts is necessary, a dynamo being conveniently employed as the source of current in this case. An advantage of this apparatus is that it can be operated under a tension at which the diaphragm does not vibrate its natural period, and this obviously renders the sounds transmitted much clearer and more distinct. The condensers used for ordinary telephonic transmission are four by six centimetres in size and have a capacity of about 0.015 to 0.04 microfarad. It was also observed that the larger the apparatus for a given tension, the louder will be the sounds emitted, since much greater masses are set in vibration. The fact that the currents of the earth's magnetism do not affect the apparatus often makes it more reliable than the electromagnetic receiver.—*Translated and abstracted from Elektrotechnische Zeitschrift (Berlin), July 15.*

A LARGE ELECTRIC POWER STATION FOR NAPLES.

The law of July 8, 1904, regarding the creation of an industry for Naples, provided, as one of the means to this end, the erection of a large electric power station for furnishing cheap motive power. It was intended to utilize the waterpowers of the Volturno River, but the conditions of ownership were not perfectly clear, and the city of Naples has succeeded in securing the water rights only recently after long negotiations. Following is the plan adopted for their exploitation: The water of the sources situated between the villages of Rocchetta and Castellone Volturno, in the province of Campo Basso, is to be collected by special installations, among which is a large dam. From the reservoir the water will be conducted through an open canal 2,500 metres in length and through three high-pressure pipes to the turbines of the power station situated at the confluence of the Rochetta and Volturno rivers. The dynamos connected to the turbines will generate three-phase current of 5,000 volts, which will be raised by transformers to a tension of 45,000 volts. Electrical energy of 10,000 kilowatts will thus be produced and transmitted a distance of ninety kilometres to the city of Naples. At the receiving and distributing station in Naples the tension will be lowered to 6,000 volts. The distribution is to be accomplished by three-main nets; an overhead line is to transmit current to the factories of the free zone, armored underground cables will go into the city, and a second overhead line is to be provided for supplying the West, especially the vicinity of Bagnoli, where the enormous Ilva iron and steel works, which will be a heavy consumer, are being erected. The central station in Naples will be equipped with a 6,000-horsepower reserve installation in order to meet the requirements in times of heavy consumption. The Azienda Autonoma del Volturno is being intrusted with working out the details of this plan, and it is conservatively estimated that the work will require at least three years for its absolute completion.—*Translated and abstracted from Elektrotechnischer Anzeiger (Berlin), July 15.*

ERECTING OVERHEAD MAINS IN DIFFICULT PLACES.

When commencing to erect overhead mains in shipyards, dock estates, railroad sidings, and other difficult places, the best way is to walk over the ground and make a plan of the positions of the poles, or drive wooden pegs into the ground where the poles are to be erected; after doing so, plan out how the mains are to be run, taking particular care to note where the strain is likely to be, the number of mains on each pole, and where telephone guard wires are to be erected. When erecting mains in such places, the author (William Copeland) recommends poles of not less than twenty-four feet from the ground level to the first arm. Wooden poles are to be preferred on account of cheapness. They should be of red fir, free from large knots, and creosoted, and care should be taken to select them with a good taper. When erecting the arms, cap finial and earth wire, care is to be taken that all are connected together at the top, and the wire brought down to the bottom of the pole, and twisted two or three times round the butt to make a good earth. Wooden arms of sound oak, well seasoned, are to be recommended rather than iron arms when using bare copper mains. Where there is any likelihood of any strain on the insulator, twin oak arms should be fitted on the pole, each fitted with an insulator on each side of the pole to take the strain, and when heavy mains are erected, the arms ought to be strengthened by an oak lath erected in a perpendicular position between the arms on each side of the pole; iron should not be used; it is expensive to maintain. For foundations on such places, concrete is not good on account of so many alterations occurring; it is too expensive to take out the poles, which have to be cut down and spoiled. The best and cheapest way, in the author's experience, to erect poles in these places, is to dig a hole about six feet deep or so, according to the height of the pole, and have four nine-inch wooden deals five feet long placed vertically at the sides of the hole, then place the pole to be erected in the center of the hole, fill into the hole about a foot of earth, and place a nine-inch deal on each side of the pole, a tight fit. Afterward fill in the earth and ram well up to five feet, then place a nine-inch deal on each side of the pole, a tight fit, and afterward fill in the earth and ram well up to the ground level. The author has found this to give every satisfaction where heavy strain has come on the pole. Where this is likely to be the case a good way is twin a pole and so erect them that the poles are at an angle to each other, so as to divide the strain equally between them; the poles should not be erected in parallel. The author's experience in such places with heavy mains has been to erect four poles, and he has found they are better on an angle than square. Insulators and bolts should be strong; three-fourths-inch bolts are considered quite small enough. Guards need not be used when wooden laths are employed. The P. O. insulators have been greatly used, even for high voltages, but the binders are some trouble and expensive to maintain, and are not to be relied on. The author has invented a bindless and practically unbreakable insulator, which can be used for any class of wire or cable. It can be employed for aluminum wires; with a porcelain cover, such an insulator is badly needed for such wires, as great troubles are experienced, owing to the action of the binders on the aluminum wire. The insulator is carried on an ordinary bolt, which has a square collar, in order to hold or turn it by means of a key or otherwise. The body is a porcelain insulator, with the usual sheds, and has a horizontal groove round it which contains the wire, the latter projecting somewhat from the groove. In the top of the insulator is a screwed socket for a stud bolt, this socket being entirely separated from the socket for holding the bolt by a sufficient thickness of porcelain. The stud bolt has an ordinary right-handed screw on each side of a central collar, and there is a cap, which can be made of porcelain, or of cast-iron, or other like metals. This cap is provided with two slots, so that it can pass over the wire when placed in position, and comes down tight on to the wire. The cap and insulator are preferably somewhat conical in shape, but the cap is rounded at the top. The mode of erection is as follows: The bolt being screwed into the insulator in the usual manner, and the stud being also screwed into the insulator, the bolt is put in its supports, but not tightened up. The line wire is placed in the groove, and the cap dropped over, resting on the stud. The cap is now held by the hand and guided centrally, and the bolt turned round until the upper screw of the stud screws tight into the cap and holds the latter tight against the wire. The wire is now firmly fixed There is a special value attached to this insulator, for it can be used for a shackle insulator or on a curved or straight line, which is a great consideration when erecting overhead mains in such places; one class of insulator is all that is required. Bare copper wires are recommended for mains; they are approved of by the Board of Trade, and are much cheaper and lighter, and stand the atmosphere much better; insulated wires are expensive to purchase, not so easy to work with, and carry coal dust, snow and ice, which all give trouble. When using bare copper mains, the arc-lamp poles should not be used to carry them, as they are dangerous to pass through when attending to the arc lamps. Connections from the mains should be made of bare copper, preferably solid copper wrapped with Blackley tape and varnished; these are more suitable to withstand the winds. It is not uncommon to use insulated wire with coils of a pretty spiral form, about twice the length they should be, and when the wind blows a few weeks afterward the connections break and the lights go out. Bare copper connections are much stronger, and will last for years if properly made. When a number of connections are taken off the mains and the mains are long, a joint box or double-pole or triple-pole switch should be used for testing purposes, etc., and on larger installations the ring type of mains is a good idea, and has been found to be very valuable. A main starting from the substation is run round the estate and back to the substation, with a switch half-way to break the ring, and, say, two or three more switches in the ring, as the case may be. In the case of a breakdown, only one-third of the system or so, according to the number of switches used, is out of use at a time until all is repaired.—*Abstracted from The Electrical Review (London), July 23.*

Electric's Long Trip.

George W. Daly, who has just accomplished the great feat of driving the Woods electric victoria automobile from Philadelphia to Pittsburg and return, was given a very enthusiastic welcome by the Quaker City Motor Club members and a large party of his personal friends interested in motoring. Notwithstanding the generally rough roads which the sturdy little Woods car had been driven over during the past two weeks, the pretty vehicle looked little the worse for wear, and Mr. Daly stated that he had experienced absolutely no trouble from the time he left Philadelphia till he returned.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

The Flow Indicator.

The Flow Indicator, as its name implies, is used for insertion in pipe lines to indicate at a glance that flow is taking place therein. It may be used to indicate the flow of boiler feed water, water discharging from a pump, the gas intake of an internal-combustion engine or the flow of jacket water for the same, the flow in circulating oil systems, or the like.

The device is made of brass, and comprises a valve body, with inlet and outlet connections for piping. In the valve body, and facing an aperture in the side, is a pivot ring carrying an indicator or flap. The pivot ring can be moved into any position, allowing the device to be operated in either a horizontal, vertical or angular position.

A glass disk in the aperture, held by a ring nut, allows a clear sight of the flap at a distance of twenty-five feet or more; and from the position of the flap (the flap having on its edge a red face with black arrow), is shown at a glance whether the liquid is flowing. If the liquid is not flowing, the flap will fall to a position at rest on the bottom of the body, and can readily be seen in this position.

THE FLOW INDICATOR.

This device has found many applications in steam power plants, in isolated plants, in breweries and similar works.

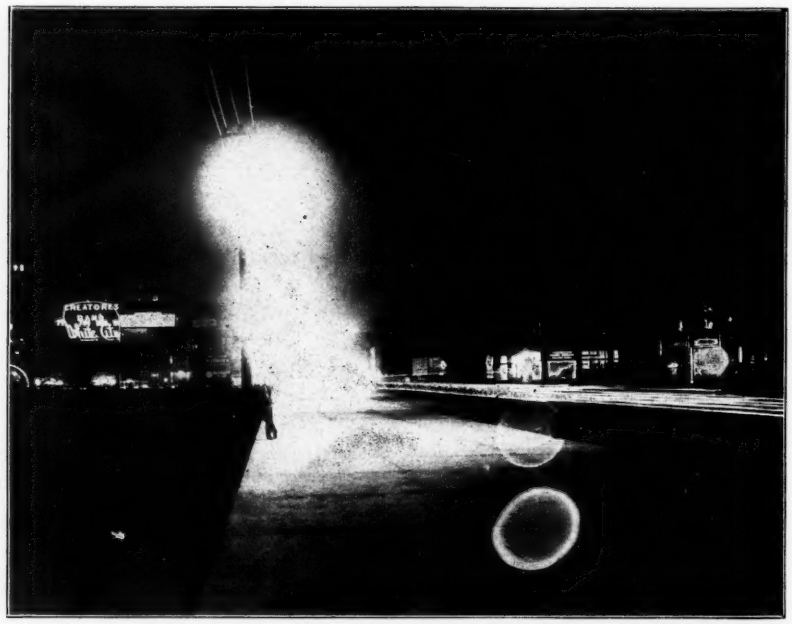
If desired, the device can be furnished with an electrical contact, which, when connected through a battery or other source of power, will close a circuit which will light a lamp or operate a buzzer, when the flow of the liquid, etc., through the indicator is stopped.

Free flow of the liquid is in no way impeded by the use of the indicator.

The agent for the Flow Indicator in this country is A. W. Von Lilienthal, 25 Broad Street, New York, N. Y.

Excello Series Flaming-Arc Lamps.

The Excello Arc Lamp Company, Chicago, Ill., has perfected a series flaming-arc lamp, the saving in operating costs of which, according to its engineering department, makes it a leader in this field of illumination. The company is demonstrating the features of this lamp to the Chicago South Park commissioners, and has been granted the privilege of installing a number of lamps in the direct-current 9.6-ampere circuit located on Michigan Boulevard near Twelfth Street, Chicago.



NIGHT VIEW OF MICHIGAN BOULEVARD, CHICAGO, LIGHTED BY SERIES FLAMING-ARC LAMPS.

The lamps are hung twenty-two feet from the ground. They are fitted with the prismatic inner globe, giving a maximum distribution at thirty degrees from the horizontal. The current consumption of these lamps is forty-seven volts and 9.6 amperes. The yellow flame produces a penetrating light, which is particularly adapted to a thoroughfare such as Michigan Boulevard.

This series lamp is differentially wound and when used for constant-current operation is fitted with a pair of starting coils and cut-out contacts, which operate as follows: When the current is turned on, the contact is closed, short-circuiting the lamp. The moment the carbons come together a current is established through the starting coils, which are in series with the carbons. This energizes a pair of poles, attracting the iron bar which breaks the short-circuiting contact. A safety contact is also provided, located on the rocker, so that when the voltage becomes excessive, due to the carbons burning out, or faulty operation of same, shunt coils pull the rocker down, causing the auxiliary cut-outs to operate. The auxiliary cut-out simply short-circuits the starting coils, causing them to be de-energized. This releases the iron bar, causing the starting contact to close and again short-circuit the lamp. It will be noticed that the operation of this lamp is similar to that of the old open arc, but the distinct feature on which patents have been based is that the auxiliary cut-out is used to de-energize the starting coil, which heretofore has not been taken advantage of.

Engineering Department Promotions.

The New York Public Service Commission passed a resolution providing for the promotion of about twenty men in the engineering department to grades which will secure for them an increase of salaries ranging from $150 to $300 annually.

Operating Costs of Commercial Electric Vehicles.

In the æsthetic desire for clean cities, better streets and more room in them, we turn to the electric vehicle. But, partly on account of its comparatively recent adoption and partly because of apparently bewildering figures the electric vehicle for trucking and delivery service in the every-day conditions of modern business has not been as generally adopted as its record of service warrants.

One of the strong features in favor of the electric vehicle, but one which is rarely given commercial consideration, is that a surprisingly large number of deaths in the larger cities are caused by diseases transmitted in germ-laden dust, and most of this dust is caused by the litter from the large number of horses in the streets.

When the cost for housing a delivery equipment is high, it pays to consider the advantages of the electric vehicle. It has been stated by firms which have used both the electric and horse-drawn vehicles, that one electric in service does the work of two horse-drawn wagons of the same capacity and eliminates extra horses which must always be available. One-fifth the amount of stable room is necessary. Another item of expense which is eliminated is that of feeding and caring for the horse while not in service. If one-half the amount of care would be taken of the electric when not in service it would always be in good operating condition.

The heat of summer and the snow and ice of winter do not interfere with the operation of the electric, while on the other hand horses are always encountering difficulties during inclement weather.

	Capacity.	Purchased.	Per Month.	Per Day (26 to Month).
Globe-Werneke Co., Cincinnati, O.	Two 2-ton trucks.	Aug. 11, 1905. Oct. 6, 1906.	$ 69.83	$2.79
W. H. Harrison & Co., Cincinnati, O.	2,000-lb. wagon.	June 5, 1905.	78.47	3.14
G. E. Markley & Co., Cincinnati, O.	4-ton truck.	Sept. 20, 1905	119.17	4.58
Winegar Furniture Co., Grand Rapids, Mich.	2-ton truck.	April 20, 1905	71.48	2.86
Valley City Mill Co., Grand Rapids, Mich.	5-ton truck.	June 17, 1905.	95.95	3.80
Warfield, Pratt, Howell Co., Des Moines, Ia.	5-ton truck.	July 22, 1905.	151.43	5.82

Herewith is a table of interesting figures compiled by C. P. Chrysler, western manager of the General Vehicle Company, showing the expense of maintaining electric trucks manufactured by the General Vehicle Company. The figures are taken from itemized statements submitted by firms which have been using the electric trucks for a period of four years and should prove interesting to those now using the horse-drawn wagons.

For the above firms these trucks replace two teams of horses, so an idea of the saving can be gained. The figures include such items as storage, replacements of every description, insurance, painting, accidents, depreciation, and, in the case of Warfield, Pratt, Howell Company, the salary of the driver.

Central Electric Opalux Tungsten Fixtures.

Up to the present time comparatively little attention has been devoted by manufacturers to the production of moderate-cost lighting fixtures which, in addition to taking advantage of high-efficiency lamps and reflectors, would also have an artistic appearance comparable with the more expensive creations.

In the past, it has too frequently been the custom of the fixture manufacturer, as well as the dealer, practically to ignore the vital relations of the various elements, and the result has been a combination of fixtures, reflectors and lamps, which, while reasonably efficient from an illuminating standpoint, were frequently little short of hideous from an artistic standpoint.

CENTRAL ELECTRIC OPALUX TUNGSTEN FIXTURES.

Appreciating the demand for a well-balanced, moderate-priced lighting fixture for use with tungsten lamps, the Central Electric Company, Chicago, Ill., in conjunction with the Price-McKinlock Company, Boston, has developed a complete line of "Opalux" tungsten fixtures, consisting of seven distinct designs, one of which is shown in the accompanying illustration.

The construction of the fixture is substantial, and the design balanced in all its details.

The Opalux reflector is particularly well adapted for use with high-efficiency lamps, as it not only transmits sufficient light to prevent deep shadows on the ceiling, but, owing to its diffusing surface, gives a distribution free from glare. Another advantage of the Opalux reflector is its comparative freedom from tendency to collect or retain dust. Again, it has been demonstrated by actual test that Opalux reflectors suffer the less from a deposit of dirt for the reason that the reflecting surface is entirely on the inside of the bowl, so that any deposit of dirt and dust on the outer surface has practically no effect on the efficiency of the reflector.

An illustrated circular, descriptive of the above fixtures and reflectors, is being distributed by the Central Electric Company and should prove interesting to central-station managers, architects and consulting engineers.

Storage Batteries and 24-Hour Service.

In 1907 the Sisseton Mill and Light Company, of Sisseton, S. D., decided that it would be distinctly advantageous to maintain a day circuit, if it could be accomplished without a prohibitive expense, as it was felt that it would result not only in giving better service to the existing customers but would enable them to obtain a number of new customers who would not consider electricity unless a twenty-four-hour service could be promised.

It was out of the question to give this service by operating the generating equipment, as the additional cost of fuel and labor would have been excessive. Consequently, in September, 1907, a battery of 134 "chloride accumulator" cells, manufactured by the Electric Storage Battery Company, of Philadelphia, with a capacity of twenty-five amperes for eight hours, was installed. The battery jars were of such a size that the capacity of the battery could be increased forty per cent at any time by the installation of additional plates, thus providing for the natural growth of the day service. This battery has now been in service nearly two years.

The gross business has increased twenty-five per cent. The total expenses have only increased five per cent. The net receipts have increased by an amount equal to approximately twenty-five per cent of the cost of the battery.

Developments in Holophane - D'Olier Steel Reflectors; Campaign to Delevop Industrial-Plant Lighting.

With the issuing of a new bulletin (No. 23), devoted to Holophane-D'Olier steel reflectors, the Holophane Company launches upon what will be a very aggressive campaign to develop industrial-plant lighting.

As is well known, such lighting has not received much attention from the scientific standpoint. Illuminating engineers and manufacturers of lamps and lighting equipment, with one or two notable exceptions, have let this important branch of lighting take care of itself. The Holophane Company, having perfected its line of steel reflectors, will devote a considerable portion of its attention to this work in future, applying to it the same skill and engineering ability that has marked its advance in other departments of illumination.

Beginning September 1, the steel-reflector department of the Holophane Company will have several engineers working exclusively upon factory and shop lighting. These engineers will be prepared to undertake any problem in industrial lighting that may be offered, and their services are placed, without charge, at the disposal of central stations, electrical contractors, supply dealers, and others who may be able to utilize their expert knowledge in this line of work.

HOLOPHANE-D'OLIER STEEL REFLECTOR.

The new line of Holophane-D'Olier steel reflectors is well worth careful study. Every detail of design and manufacture has been improved. A new type of ventilated holder has been adopted which does away with overheating and deterioration of lamps. A better reflecting surface has been developed, which not only improves the efficiency, but completely eliminates objectionable streaks or striations and gives practically perfect color-value to the light.

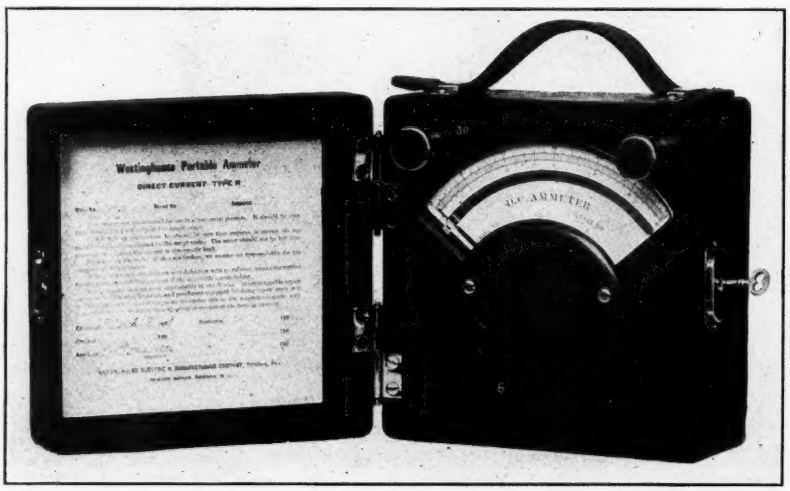
The reflector herewith illustrated is the new No. 72, which is specially designed for tungsten lamps.

New Direct-Current Portable Meters.

All authorities agree that meters working on the D'Arsonval principle, with a current-carrying coil moving in the field of a permanent magnet, are superior to any other type. Heretofore it has been impossible to obtain moderate-priced meters of this type, owing largely to the high cost of manufacturing the delicate moving elements.

The Westinghouse company has refrained from putting on the market portable meters of the cheaper "moving-iron" type, because of their inherent disadvantages, but for some time it has been perfecting designs and methods of manufacture in order that meters of the moving-coil type of high-grade construction could be produced at a reasonable price.

The Westinghouse type R meters are for direct-current measurements and can be supplied for any current or voltage. Some of the interesting features embodied in these instruments are their excellent dead-beat qualities, practically uniform scale, polarity indication, freedom from effects of temperature change or external field, adaptability for use with shunts, and absence of residual errors.



NEW DIRECT-CURRENT PORTABLE METER.

The single air-gap construction enables the moving coil to be moved without opening the magnetic circuits, and thus permanently weakening the magnets. This facilitates the making of repairs by the meter user. The construction is especially suited for portable meters, because the coil and pointer balance each other on the moving element. There is ample clearance between the magnet pole-tips for the moving coil, while the reluctance of the single gap is not high. The ammeters are either self-contained, with double range, or have separate shunts, the large sizes, of course, having external shunts. These shunts are interchangeable, and are made of a special alloy which has zero temperature coefficient and avoids all error due to the thermo-electric effect of difference in temperature between the alloy and copper terminal junctions.

The meters are put up in walnut cases six-and-one-fourth by six-and-one-fourth by four inches, and weigh about five pounds.

The New 200-Volt Tantalum.

The demand which recently led the General Electric Company to extend its production of tungsten lamps into voltages from 200 to 250, also included the other metallic-filament lamps.

In response to this demand, the company has formally listed and is now producing tantalum lamps adapted for the higher voltages, thus obviating the inconvenience of having to operate two tantalum lamps in series.

These 200 to 250-volt tantalum lamps —fifty and eighty watts, respectively— have given most excellent results on service tests, their life averaging fully up to that of the regular 100-130-volt tantalums of the same efficiency, two watts per candle.

They are, respectively, two-and-five-eighths and three-and-three-fourths inches in diameter.

Mechanical Stoking.

While mechanical stoking is an undoubted advantage in large plants, the use of mechanical stokers in small central stations is not to be recommended as a general rule. The exception is when the grade of fuel available is one specially adapted for automatic stoking.

THE ELECTRICAL EQUIPMENT OF TEXTILE MILLS.

BY D. H. BRAYMER.

The accompanying illustrations show the method of installation of electric drive in a new textile mill of the most modern construction. This mill, which is one of the largest in North Carolina, is located at Belmont, N. C., and operated by the Majestic Manufacturing Company. All the motors used are three-phase, sixty-cycle, 2,200-volt Hawthorn induction motors of the Western Electric Company's manufacture, and connected to the machines by what is known as the four-frame drive.

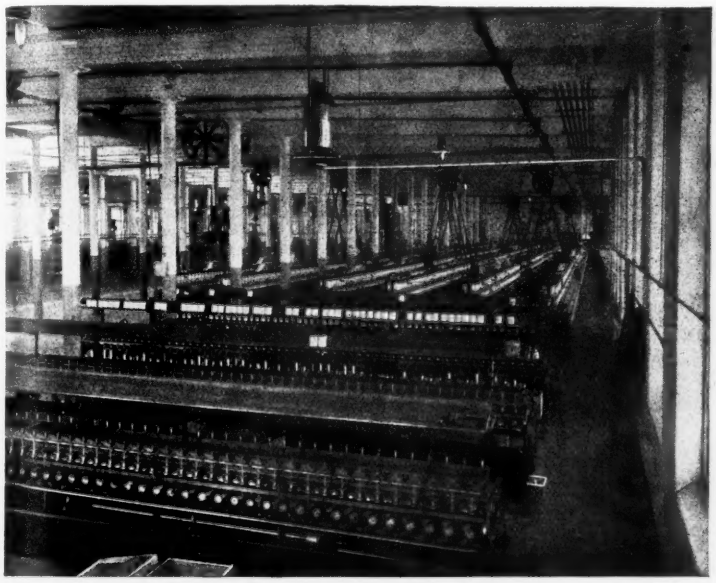


FIG. 1.—GENERAL VIEW, SPOOLERS IN FOREGROUND, SPINNING FRAMES IN BACKGROUND, MAJESTIC MANUFACTURING COMPANY.

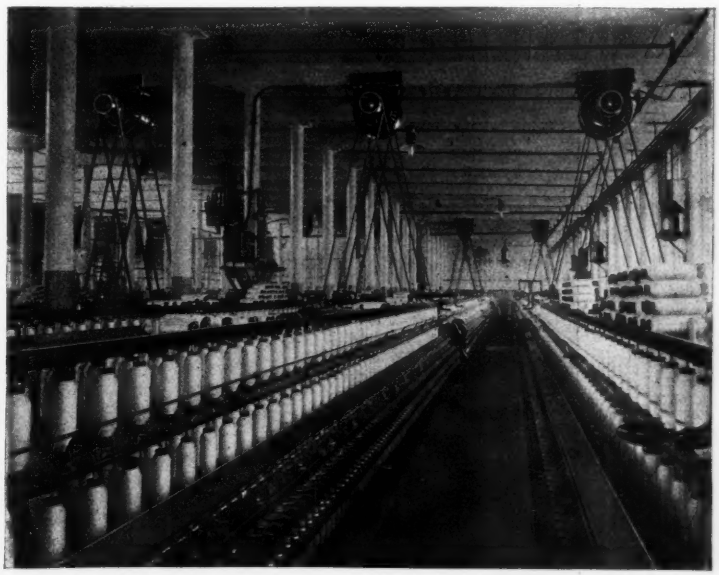


FIG. 2.—SPINNING ROOM, SHOWING EACH 20-HORSEPOWER MOTOR DRIVING FOUR FRAMES, MAJESTIC MANUFACTURING COMPANY.

The application of power to the textile industries has its peculiar features inherent in the nature of the material worked with. The material differs in elasticity and strength, and it is therefore necessary that the driving power provide an even and steady torque, that it be governed by a controlling device which is as sensitive as the most sensitive thread, and that it run with the least possible friction.

The question of whether direct or group drive is to be used, is answered by each individual case. No general and broad sweeping statement can be made as to which system shall always be applicable; still, for all this, direct drive is always advised wherever it is possible. There are comparatively few machines which do not lend themselves to individual drive, and where such is used, mechanical losses are reduced to the least possible amount, and belts, line shafting and gear wheels are dispensed with. In brief, the main advantages for individual drives are as follows: Increased output; saving in power due to elimination of frictional losses in shafting and belting, and corresponding saving in labor and attendance; convenience of placing any machine wherever desired without reference to shafting or crane location; increased light; convenience and freedom from dust and dirt due to the elimination of shafting and belting; increased safety and freedom from accidents to employes; the ability to operate a single machine overtime without the necessity of operating any other machine; elimination in loss of power for running idle machines and shafting.

When several machines are operated by one motor, there is, of course, a smaller first cost. This, however, is not the principal reason for this method of drive, for there are certain conditions of operation in the textile mill which demand a group drive. It is often required to stop and start certain machines frequently, and on this account a motor sufficient to carry the load without injury is altogether too large and expensive for steady running at a load smaller than the one for which it was designed. By grouping a number of these machines so as to be operated by one motor, the demand on the motor can be evened up and it be made to operate at its usual and most efficient load.

Flexibility and steadiness of the driving machines are absolutely essential for the best quality of textile products. The flexibility of electric-motor applications is one of the features which is always readily admitted. It is easily seen that a machine with individual drive need not interfere or have any running relations with any other, and that the shut-down of its neighbors affects it not in the least. Any change may easily be made, and additions to any part of a system or department may be made while all the machinery is operating. Individual motor drives are sometimes questioned on account of the greater initial cost of their installation. This, however, is not an objectionable feature, for if a mill be designed at one time for a certain capacity, the flexibility of the installation allows not only the maximum load to be carried, but a very light load at exactly the same power efficiency.

The electric motor has already established its reliability; this no one questions. Every mill owner has seen it working under the most trying conditions of all classes of work. The textile mill presents no radically new features as to the load. It cannot differ greatly or present a more varying load than that of a machine shop with its cranes and elevators, the motors of which may be overloaded one minute followed by a decided underload, and next perhaps a reversal of rotation. In these cases, motors are more reliable and are generally depended upon for the power of such installations.

Under the head of economy, motor drives score a strong point. The efficiency of the most modern means of mechanical transmission, with the use of scientific

lubrication by oils of suitable viscosities, is far from being equal to that of the group drive using electrical power. With the motor drive, an increased efficiency is introduced, first between engine and generator, then in the distributing mains and finally in each individual motor. A large amount of belting and gearing is dispensed with, which means eliminating line shafts and clearing the atmosphere in which the machines are worked.

As to the general or main items of saving for small plants in a vicinity where electrical power is easily obtained, the reduction is first in the capital outlay effected by the elimination of engine houses,

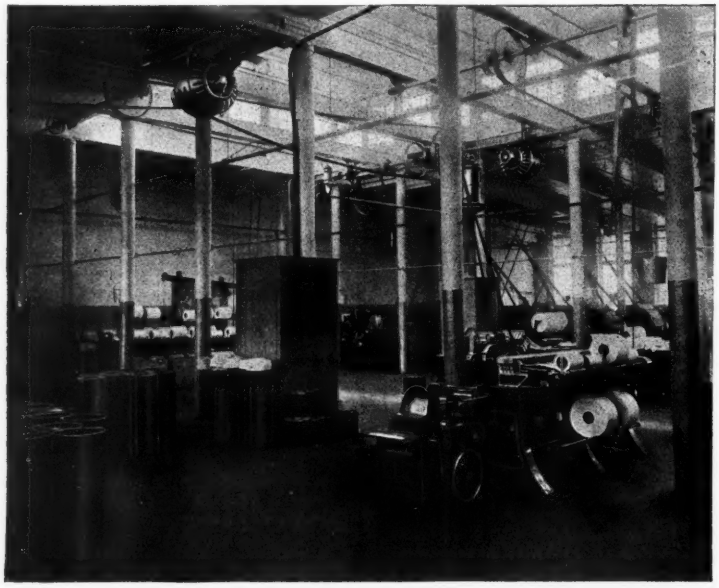


FIG. 3.—CARD ROOM, MAJESTIC MANUFACTURING COMPANY.

boiler settings, flues, chimneys, etc., and next by the capital invested in equipment.

As already stated the motors installed in the Majestic Manufacturing Company's new mill are of three-phase induction-motor type. In the spinning and spooling departments (Figs. 1 and 2) the four-frame drive is used; that is, each motor drives four separate frames. Two pulleys are mounted on each end of the rotor shaft, and each is connected to a frame by a belt. In all cases the motors are rigidly suspended from the floor beams and arranged in rows. For starting there is mounted near each motor a line panel and auto-starter, the line panel being equipped with a three-pole, single-throw, automatic oil switch.

The equipment in this mill is typical of the modern tendency toward the economical powering of all mills and factories and also shows in a general way the adaptability of the induction motor.

The Allis-Chalmers Company Reports Good Business.

The following are only a few out of a large number of recent sales of Allis-Chalmers (Milwaukee, Wis.) electrical apparatus, exclusive of combined generating units, which constitute a large list in themselves:

Merchants' Heat and Light Company, Indianapolis, Ind., two 1,000-kilowatt, synchronous, motor-generator sets, three-phase, 2,300-volts, sixty-cycle, alternating-current, 250-volts shunt-wound direct-current, and one 200-kilowatt, shunt-wound balancing set, consisting of two 125-volt machines on a common cast-iron base; San Francisco Gas and Electric Company, San Francisco, Cal., two 1,000-kilowatt, synchronous, motor-generator sets, three-phase, 11,000-volts, sixty-cycle, alternating-current, 275-volts compound-wound direct-current; Great Northern Railway Company, St. Paul, Minn., nine induction motors, aggregating 220 horsepower, 440-volts, three-phase, sixty-cycle; Joseph Light and Power Company, Joseph, Ore., one 225-kilowatt, alternating-current, waterwheel-type generator, 2,300-volts, three-phase, sixty-cycle, with exciter and switchboard; Portland Railway, Light and Power Company, Portland, Ore., one 500-kilowatt, vertical, direct-current generator, 600-volts, with switchboard; Victor Talking Machine Company, Camden, N. J., eight type "K" motors, aggregating 530 horsepower, 220-volts, direct-current; Goodyear Lumber Company, Tomah, Wis., nineteen induction motors, aggregating 925 horsepower; Crane Company, Chicago, Ill., one 300-kilowatt, synchronous, motor-generator set, 440-volts, sixty-cycle, alternating-current, 250-volts, direct-current, and three 100-horsepower induction motors, 440-volts, sixty-cycle; Illinois Steel Company, Joliet, Ill., one 1,250-kilovolt-ampere, synchronous, frequency-changer, changing from three-phase, 2,200-volts, sixty-cycle, to three-phase, 6,600-volts, twenty-five-cycle, 300 revolutions per minute; one 200-kilowatt, synchronous, motor-generator set, three-phase, twenty-five-cycle, 6,600-volts, 2,200-volts direct-current, together with switchboard; Pacific Lumber Company, Wilmington, Cal., seventeen induction motors, aggregating 510 horsepower; Royal Weaving Company, Pawtucket, R. I., thirteen O. F. S. C. transformers, aggregating 1,200 kilovolt-amperes, 2,200 to 220 volts; city of Ellensburg, Wash., one 550-kilowatt, waterwheel-type alternator, three-phase, sixty-cycle, 6,600-volts, together with switchboard, exciter, and three 200-kilovolt-ampere, O. F. S. C., 6,600-volt transformers; National Casket Company, Pittsburg, Pa., twenty-four induction motors, 440-volts, three-phase, sixty-cycle, aggregating 275 horsepower; Franklin Power Company, Farmington, Me., two 200-kilowatt, 600 revolutions per minute, 2,300-volt, three-phase, sixty-cycle alternators, together with exciters and switchboard equipment; Lowland Worsted Company, Woonsocket, R. I., thirty-one induction motors, 550-volts, three-phase, sixty-cycle, aggregating 350 horsepower, together with textile switches; Daniel D. Weschler and Sons, Inc., Milwaukee, Wis., one 300-kilowatt, 200 revolutions per minute, 240-volt, three-phase, engine-type alternator, one 150-kilowatt, 200 revolutions per minute, 240-volt, three-phase, engine-type alternator, together with exciters, and six induction motors, aggregating 200 horsepower; Chicopee Manufacturing Company, Chicopee Falls, Mass., sixty-eight type AN induction motors, aggregating 484 horsepower; Apache Cotton Oil and Manufacturing Company, Chickasha, Okla., three type AN induction motors, aggregating 350 horsepower; Steptoe Valley Smelting and Mining Company, McGill, Nev., five type AN induction motors, aggregating 400 horsepower; Armour and Company, Chicago, Ill., one 250-kilowatt, engine-type alternator, 200 revolutions per minute, 1,150-volts, three-phase, sixty-cycle, together with exciter, one 500-kilowatt, engine-type alternator, 150 revolutions per minute, together with exciter.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, JULY 30.—Some further facts have come to light which emphasize the obstinacy with which the City of London Corporation is treating the question of public lighting. As I have already pointed out, the original arc-lighting contract was at $130 per lamp, and some hundreds of these old-fashioned lamps are still burning at this high price. Yet the Corporation has been made an offer by the City of London Electric Lighting Company to light the whole of the city at a reduction of thirty per cent, equal to £4,000, by being allowed to substitute flame-arc lamps. This offer, and two later offers on an even more advantageous basis, have been ignored. It is common knowledge that the gas company is carrying out a small amount of high-pressure gas lighting at a price which does not include at any rate all the capital charges, yet if the electrical companies were to do this, they would run the risk of being pulled up by the Board of Trade, or somebody else, for breaking the electric-lighting acts by giving preferential treatment. A fact which has also been overlooked in this controversy is that at Berlin, where the gas lighting very much impressed the committee which recently visited there, the municipal authority charges for public lighting less than one-half the price charged for private supply.

An important statement was made by the Postmaster-General this week to the effect that the Postoffice authorities would be willing, on equitable terms, to acquire all the land stations of the Marconi Wireless Telegraph Company. He stated that the Government had come to the conclusion that the principal wireless stations should not be in the hands of private individuals, and in order to prevent the growth of any monopoly, all the licenses, which would expire in three years' time, would then be taken over. An earlier acquisition, in fact, was desirable if possible. From a subsequent interview, it appears that pourparlers to this effect have already been set on foot with the Marconi company.

October 1 is announced as the date of opening the single-phase railway in London of the London, Brighton & South Coast Railway Company. Meanwhile, experimental runs are being made. In this connection, may be mentioned an interesting statement by the chairman of the East London Railway Company. He stated that the question of electrification, which has been under consideration for several years, the company being more or less derelict, must still remain in abeyance, as the results of working with third-rail continuous current system had proved unsatisfactory and no data were available as to the practical working of the single-phase system.

The unsatisfactory condition of the British electrical manufacturing industry during 1908 has been commented upon at several annual meetings during the past week, and complaint has been made that the Victoria Falls Power Company, operating as it does upon British soil, should have placed the major portion of its orders for the necessary electrical machinery in Germany.

A special conduit-cleaning machine has been devised by the tramways staff of the London County Council, by the use of which a saving of $10,000 per annum is anticipated over the present hand methods. The machines cost $1,500 each. G.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, AUGUST 7.—While the United Wireless Telegraph Company has made an offer to the Dominion Government for the acquisition of the Government's wireless stations on the Pacific Coast, it is learned at the Marine Department that it is not the policy of the Government to sell. On the contrary, the Government, in addition to the five stations there, proposes to build three more this summer, and the whole system will be adapted to commercial uses as well as the signal service.

Mr. J. W. Willard, of California, president of the Ottawa & Morrisburg Electric Railway Company, states that the first survey of the proposed new line has been made, and the route has been staked out. An additional survey is, however, being made for the purpose of deciding on which side of the road it is best to run. Work will be well under way on the line before winter sets in.

The Toronto Electric Light Company is endeavoring to forestall delivery of power in the city of Toronto by the Hydro-Electric Commission in December next. The company, with the aid of a force of expert canvassers, has already secured good contracts to supply light to a number of institutions for the next five years, and is engaged in installing equipment on the premises of many of its customers which cannot be utilized by the city when the latter gets its lighting department in operation.

Contracts for the remaining ten transformer stations, required for the provincial government's transmission system, have been let. The Toronto station will be built by Witchall & Son, of that city, whose tender was $36,500. Hyatt Bros., of London, Ont., will build the London station for $26,500, and John Hayman & Sons, of London, will construct the remaining eight buildings situated at Woodstock, St. Mary, Preston, St. Thomas and Guelph. The latter firm put in a bulk tender of $148,000, or $18,500 for each station. The erection of transmission towers and the telephone lines is progressing rapidly, the contractors now being able to set in place at least fifteen towers a day.

Strong advocacy of the electric smelting of iron ores in Canada is made in a report issued by Dr. Haanel, director of the Department of Mines, at Ottawa. Following the experiments undertaken by the Dominion Mines Department at Sault Ste. Marie, Dr. Haanel made investigations in Sweden and elsewhere on the Continent, and it is upon the result of these inquiries that he bases his report. Within the past four years, sixty electric furnaces have been established, and Dr. Haanel is of the opinion that they are well adapted to Canada, where waterpower is cheap while the coke required in the old style of furnace is high. The cost of production in Sweden is $12.40 per short ton, but Dr. Haanel thinks that it will be considerably less in Canada. By the electric process it has been demonstrated that certain foreign elements can be eliminated which cannot be got rid of in the ordinary blast furnace method. W.

LIGHTING AND POWER.

(Special Correspondence.)

GLENDALE, CAL.—Bonds are to be issued for an electric-light plant.

ALBION, NEB.—The Albion Electric Light Company has been incorporated with a capital stock of $30,000.

PRESCOTT, WIS.—The Prescott Light and Power Company has been granted a twenty-five-year franchise.

STARBUCK, WASH.—The Starbuck Electric Company has been incorporated with a capital stock of $25,000.

SUPERIOR, NEB.—The Superior Electric Light Company has been incorporated with a capital stock of $50,000.

SANTA BARBARA, CAL.—The Pacific Improvement Company has been granted an electric franchise in this city.

FORT FAIRFIELD, ME.—The Maple Grove Electric Company has been incorporated with a capital of $50,000 by I. Conant and C. M. Waldron.

LYONS, N. Y.—The Public Service Commission has granted permission to the Syracuse Lighting Company to execute a mortgage for $2,500,000.

HAMILTON, MONT.—W. O. Fisk announces that the electric-light plant at this place is to be remodeled and made more modern in every respect.

PETERSON, IOWA—A franchise has been granted to an electric-light company to light both Peterson and Sutherland from a single plant at Peterson. C.

MENOMINEE, MICH.—The Commercial Club has arranged for the installation of a street-illuminating system, consisting of thirty arches of incandescent lights. C.

PRAIRIE DU SAC, WIS.—The secretary of war has approved the application of the Southern Wisconsin Power Company to construct a dam across the Wisconsin River. C.

SHEBOYGAN, WIS.—The Milwaukee Bridge Company has let the contract to the Acker Electrical Company for the electrical equipment of the Pennsylvania Avenue bridge. C.

VALIER, MONT.—An electric-light and power plant is to be built at once, and poles are on the ground for a telephone system, it being stated that cables and material are on the way to the site.

WENATCHEE, WASH.—The Wenatchee Electric Company has let a contract for the raising of the walls of its Columbia Street plant house sixteen feet. Bird & Holmes have the contract.

LOS ANGELES, CAL.—The first steps in the developing of electrical power on the Owens River aqueduct were taken here last week, when the City Council approved the recommendation of the Board of Public Works asking for $10,000 per year for

the next two years, to be spent in the preparation of plans for power development and arranging to bring the electricity to the city at the same time as the water.

GREELEY, COLO.—Incorporation papers have been filed by the Fort Lupton Utility Company, capital $50,000, divided into 50,000 shares. The company will operate an electric-light and power plant.

PORTLAND, ME.—The Sierra Pacific Electric Company has been incorporated to deal in electricity, with a capital of $11,500,000. President, C. M. Drummond, Portland; treasurer, E. H. George, Boston.

ANTIGO, WIS.—The Antigo Electric Company has been incorporated, with a capital stock of $125,000, by John Manser, Chas. M. Cleveland and F. A. Hecker, to construct street and interurban railroads and to acquire and develop waterpowers. C.

CINCINNATI, OHIO—The Public Service Corporation, of Glen Jean, W. Va., has been incorporated; authorized capital stock, $20,000; incorporators, R. J. Stegall, J. S. Staton and E. E. Thacker, of Glen Jean; R. H. Dickinson and C. S. Phipps, of Fayetteville, W. Va.

GLASGOW, MONT.—The city is contemplating the building of an addition to the present electric-light station for boiler room and pump pit; installing one steam boiler, two 500,000-gallon steam pumps, with all necessary steam and water connections, and further construction.

WORCESTER, MASS.—A big mortgage has been recorded here whereby the Milford Electric Light and Power Company mortgages to the American Trust Company its plant in Milford and Hopedale, to secure an issue of $200,000 five per cent gold bonds, payable June 1, 1929.

HELENA, MONT.—Governor Hauser reports that between $1,600,000 and $2,000,000 will be spent within the next fourteen months on the third dam at Wolfe Creek, work on which will be started within sixty days. The Stone & Webster Engineering Corporation have the matter in hand.

JACKSONVILLE, ORE.—The county of Jackson has granted a franchise to the Jackson County Electric Light and Power Company to erect pole lines for transmiting power, heat and light. The company promises to begin construction of its railway in Rogue River Valley immediately.

BELLINGHAM, WASH.—It is reported that a permit has been granted by the Forestry Department of the United States to the Thunder Creek Transportation and Smelting Company, to build a large power plant on Thunder Creek, where it flows into the Skagit River, forty miles above Marblemount.

ANTIGO, WIS.—The Antigo Electric Company will expend about $150,000 on a new plant, including, besides the equipment, a new building, 55x140 feet, of solid brick construction. The company also expects to develop the waterpower of the Eau Claire River, owned by one of its principal stockholders.

ALBANY, N. Y.—Niagara and Erie Power Company, of Buffalo, has been incorporated; capital, $100,000. Organized to furnish electricity for light, heat and power in the towns in Erie, Cattaraugus and Chautauqua counties. Directors: Charles F. Blair, M. J. Binkley, A. F. Tideswell, all of Buffalo.

RAPID CITY, S. D.—The Dakota Power Company has consolidated the Richards, Duncan and Mansfield water rights along Rapid Creek, thus securing six miles of stream with a fall of 1,009 feet, capable of developing 8,000 horsepower. The company will spend about $1,500,000 in the development of the plant. C.

FITCHBURG, MASS.—The Fitchburg Gas and Electric Light Company has petitioned the Gas Commission to be allowed to increase its $385,000 capital stock by $308,000 (3,850 shares, par $50), at $80 per share, to fund $275,000 debts incurred for construction and improvements and to furnish $33,000 to complete the work.

JOLIET, ILL.—The new street-lighting scheme planned by C. A. Munroe, general manager of the Economy Light and Power Company, is assured, as already considerably over a hundred merchants have agreed to assist in promoting the system. The order for the new ornamental and combination poles will be placed at once.

ALBANY, N. Y.—The Public Service Commission, Second District, has authorized the Nassau & Suffolk Lighting Company to issue $420,000 six per cent preferred stock, the proceeds to be used for extensions and improvements, additional working capital to the amount of $25,000, and for payment of obligations amounting to $87,500.

HUNTINGTON, W. VA.—The construction of street-car lines on either side of the Ohio River, between Huntington and Point Pleasant and Gallipolis and Ironton, by a combination of Pittsburg capitalists interested in the development of this particular part of West Virginia and Southern Ohio, is announced. A trust deed has been recorded at Point Pleasant by the parties interested guaranteeing the payment of $750,000 of bonds, which have been floated in New York city. One of the Huntington banks will act as trustee, with a deposit from the people who are pushing the development, of $200,000, and this amount is now in the hands of Huntington bankers.

INDIANAPOLIS, IND.—The Peacock-Wooley Lighting Company, of Chicago, has offered to contract with the City Council to light the downtown portion of the city with modern lamps free of cost, or in consideration of the privilege of placing advertisements on the glass panels of the lamps. The contract will save the city $10,000 a year. S.

TOLEDO, ORE.—The City Council has granted a twenty-five-year franchise to H. L. Collins, A. C. Smith and J. F. Stewart for the erection and maintenance of an electric-light system. The same company will also operate a cold-storage plant and creamery, and later a cannery. The light plant is to be erected at once, and to be in operation within six months.

ANDREWS, IND.—The Andrews Electric Light Company has notified its subscribers that service will be discontinued for several weeks to enable the company to remodel the power plant building and install additional machinery and equipment. The company has enjoyed a good business from the start and the steadily increasing business compelled the enlargement of the plant. S.

TOLEDO, OHIO—The Citizens' Heating and Lighting Company has asked for another franchise on Toledo streets. A few weeks ago an extensive right was granted, the company to pay one per cent of its gross receipts to the city. The present franchise is asked for on a similar basis, and seeks the privilege of laying conduits on several streets, for electricity for lighting and heating purposes. H.

TORRINGTON, CONN.—The Torrington Electric Light Company is adding a 500-kilowatt Westinghouse turbine-generator set to its power station equipment, which has hitherto comprised a 300-kilowatt General Electric Curtis turbine set and a 500-horsepower Harris engine, direct-connected to a Stanley generator. The station supplies a lighting and power service, with sixty-cycle, three-phase current, at 2,300 volts.

CHARLOTTE, N. C.—W. E. Holt, Jr., C. A. Hunt and C. A. Hunt, Jr., representing the Decotah, Nokomis and Winonah cotton mills of Lexington, have contracted for approximately 2,000 horsepower of electricity from the Southern Power Company. It will supplant steam in the operation of the mills named. The necessary machinery has been ordered and the change will be made as soon as it can be installed.

MANTI, UTAH.—If the plans now under completion are carried out, Gunnison Valley will have, within a short period, a large power plant. It is the object to install two power plants, one in Six-Mile Canyon and one in Salina Canyon, for the purpose of generating electricity. It is the desire of the promoters to secure enough power to furnish light for all of the different towns in Sanpete and Sevier counties.

WHEELING, W. VA.—A charter has been filed at the office of the clerk of the County Court, certifying to the incorporation of the Warwod Water and Light Company. The chief works of this company will be located near Warwood, and is for the purpose of providing water and light for that town. The capital stock of the company is $50,000, the incorporators being B. W. Peterson, R. J. McCullagh, John A. Moore, James W. Ewing and Edmund P. Hunter.

VANCOUVER, B. C.—The Vancouver Power Company and British Columbia Electric Railway Company are spending approximately $1,000,000 over their new power plans, which means that the Coquitlam plant will be more than doubled in capacity, being increased from 30,000 horsepower to 70,000 horsepower. In addition, the Vancouver power syndicate is making plans for development of the power of the Jordan River on Vancouver Island. A large plant is to be built on the island soon, probably with a capacity of 25,000 horsepower.

MADISON, WIS.—Word has been received here that the secretary of war has approved the application of the Wisconsin Hydro-Electric Power Company for permission to build a dam across the Wisconsin River at Prairie du Sac. The conditions imposed are that the power company shall construct a lock, maintain it free of cost to the government, keep the river open for navigation at that point and remove the dam and lock if they ever fall into disuse. Magnus Swenson, of Madison, made the application. It is the construction of this dam that it is figured will furnish electric power for the cities of Southern Wisconsin.

INDIANAPOLIS, IND.—The Indianapolis Heat and Light Company has fully equipped and beautifully furnished a five-room cottage in which is shown how a family can live by electricity. In the reception room there are electric lights, electric fans and an electric grate to light, cool and heat the room. The parlor contains an electric piano, which produces excellent music when the button is pressed. The dining-room contains electric chafing dishes, coffee percolators, toasters and other electric contrivances. The kitchen is equipped entirely with electrical apparatus, in-

cluding the range, a washing machine and wringer, an ice-cream freezer, irons and other devices for baking and cooking by electricity. A sewing machine in the dining-room is operated by electricity. S.

COLORADO SPRINGS, COLO.—It is stated, on excellent authority, that the Manitou Electric Company will immediately pass into the hands of the Pikes Peak Hydro-Electric Company. The papers have been prepared, the terms agreed upon, and the signatures of the parties will be affixed in the next few days. The consideration is understood to be about $20,000, although the option of taking stock in the Hydro company will be offered to stockholders in the Manitou company.

WHEELING, W. VA.—The Hydro-Electric Development Company, of Great Cacapon, W. Va., has been incorporated, to manufacture electricity from the power of the rapids in the Great Cacapon River in Hampshire and Morgan counties, West Virginia. The authorized capital stock is $100,000. Incorporators: Wm. B. Osler and Morris A. Ornduff, of Great Cacapon; Wm. F. Disher, of Berkeley Springs, W. Va.; Samuel R. Boyer, of Hanover, Pa., and Albert Holland, of Baltimore, Md.

BERLIN, MD.—Muralt & Company, engineers of New York city, have been awarded the contract for furnishing and installing the electrical equipment of the new municipal lighting and pumping plant. Power will be generated and transmitted throughout the city by means of a 2,200-volt, two-phase alternating-current system. The alternators will be of the belted type and will be driven by gas engines supplied by producer gas. Step-down transformers reducing the line potential to 110 volts will be provided at the centers of distribution, from which the city lighting circuits will be fed.

MINNEAPOLIS, MINN.—The special committee recommends to the City Council that, before it be granted a franchise, the Northern Heating and Electric Company, of St. Paul, be required to put up a cash bond of $10,000 and a surety bond of $15,000; that it submit a statement of its finances for the six months ending July 1, 1909, and that it give information as to the new corporation which ultimately expects to take over the franchise. It has been stated that the company is backed both by the Westinghouse interests of Pittsburg and the American District Steam Company, of Lockport, N. Y. C.

POUGHKEEPSIE, N. Y.—By permission of the Public Service Commission, the Poughkeepsie Light, Heat and Power Company will construct the proposed addition to the local plant, using $250,000, or larger portion of that amount, to be realized by bonds issued by the Newburgh Light, Heat and Power Company. Power will be transmitted by cable across the Poughkeepsie Bridge, to Newburgh. The Commission has given its approval to the execution of a contract between the Poughkeepsie Light, Heat and Power Company and the Newburgh Light, Heat and Power Company, pursuant to which the Newburgh Company will install upon the premises of the Poughkeepsie Company, in Poughkeepsie, additional electrical generating apparatus.

MUSKEGON, MICH.—A purchase of a large quantity of poles has been made at Shelby by the Interurban Electric Light and Power Company, which has construction rights across Mason and Oceana counties from Hamlin Lake to Shelby. The company, which was organized to furnish electric power to Ludington, Pentwater, Hart, Shelby and smaller places along the right-of-way, has almost completed work on the lower dam at Hamlin Lake and promises to be furnishing electric power within a month. Wires are being strung from Ludington to Pentwater, and arrangements have been made to take over the Pentwater lighting plant. The company is said to have power rights on the Pere Marquette River capable of developing 30,000 horsepower.

BOSTON, MASS.—On petition of the Orange Electric Light Company for the approval of an issue of additional capital stock of the par value of $155,000 for payment of a part of its outstanding debts and the cost of subsequent additions to plant, the gas and electric-light commission has issued an order approving the issue of 1,550 shares at the price of $100, or par, per share. The proceeds are to be applied, as follows: Of 400 shares to pay the entire bonded debt of $40,000; of 200 shares to pay the full amount of $20,000 of coupon notes outstanding; of 85 shares to pay obligations represented by an equal amount of promissory notes outstanding on April 30, 1909, and of 865 shares to pay an equal amount of obligations for additions to plant since April 30.

BUFFALO, N. Y.—The plant of the Niagara Pulp Board Company in Niagara Falls was destroyed by fire July 24. It is supposed the fire started on the cable of a rope drive that was being operated. There was little or no wind, but the flames swept through the plant with surprising rapidity, despite the efforts of the firemen to stop them. The loss is about $50,000, on which there is said to be insurance of $35,000. The company's output was a pulp board used for box making. The works were being operated at full capacity to meet existing contracts. The plant will be rebuilt, possibly on the same site, which is the site formerly occupied by the Acker Process Company, on the lands of the Niagara Falls Hydraulic Power and Manufacturing Company.

ELECTRIC RAILWAYS.

(Special Correspondence.)

CHICAGO, ILL.—For the year ended June 30 last the Northwestern Elevated carried 40,955,795 passengers. This is an increase of 3,536,509 over the previous year.

GRAND RAPIDS, WIS.—Work has been commenced on the construction of the interurban line to Nekoosa. It will be seven-and-a-half miles long and power will be furnished by the water-power of the South Centralia paper mills plant. C.

CARMI, ILL.—Preliminary steps have been taken by Kansas City, Mo., capitalists for the building of an electric railway from Carmi to Fairfield. The survey will be taken in a few days and the line will be used for both passenger and freight traffic.

EXCELSIOR, MINN.—In its fight to compel the St. Paul & Suburban Railroad Company, the Lake Minnetonka line of the Minneapolis Street Railway Company, to stop its cars at street crossings, the state Supreme Court has decided against the village. C.

LEWISTON, ME.—The decree of the railroad commissioners approving the location of the proposed new electric road from Lewiston to Portland via Gray is expected to be made soon. Immediately thereafter, it is said, the work of building the road will begin.

BOSTON, MASS.—Forty-four standard semi-convertible cars have been ordered by the Boston & Northern Street Railway Company, twelve of them to be used by the Old Colony Street Railway. They are being built by the Laconia Car Company and will be delivered in September.

CASEY, ILL.—Work has been started on a traction line into the Illinois oil fields from Oblong, Ill., to connect with the McKinley system at Charleston, Ill. The preliminary work of surveying the line was completed last year. It is promised that the road will be ready for operation in about three months.

DES MOINES, IOWA—At a meeting of local and business men living along the proposed route, held at the Savery Hotel, it was decided to enlist the support of Congressman Wm. B. McKinley, who has recently purchased the Des Moines Electric Company, in the construction of an electric line to Red Oak, via Adel. C.

PINE BLUFF, ARK.—General Manager Parker, of the Arkansas, Louisiana and Gulf Railroad, has been in Pine Bluff conferring with the Board of Trade, with reference to the bonus of $100,000 which Pine Bluff is to raise for the extension of his road from Hamburg to Pine Bluff, and thence north to the Rock Island. It is stated the bonus will be forthcoming.

BROOKLYN, N. Y.—Permission has been received from the Public Service Commission to change the motive power to electricity on the Montague Street cable line, and the Brooklyn Rapid Transit Company will lose no time in remodeling the line. The decision was given on condition that the company submit plans for approval, and consent of property owners and local authorities be obtained.

DETROIT, MICH.—Articles of incorporation for the Detroit, Lansing & Grand Rapids Railway Company have been filed in Lansing. The company is capitalized at $25,000, for the purpose of constructing an electric line from Detroit, via Lansing, to Grand Rapids, and the stockholders are Oliver H. Lau and Henry M. Wallace, of Detroit, William T. Utley and Raymond G. St. John, of Chicago, and George Valentine.

FAYETTEVILLE, N. C.—The Consolidated Street Railway & Power Company has been placed in the hands of a receiver here by Judge Lyon, of the state court, W. D. McNeill, president of the company, being named receiver. This step follows the institution of several suits, while the company has been unable to float certain bonds issued, hence the acceptance of the court's protection. The operation of the road is not affected. L.

YSLETA, TEX.—The ancient town of Ysleta is soon to be connected with El Paso by an electric interurban railway. The El Paso & Fort Hancock Railroad Company has been organized to build an electric railway down the Rio Grande Valley from Fort Bliss to Old Port Hancock, passing through the towns of El Paso and Ysleta. The proposed line will be about sixty miles long and will do both a passenger and freight business.

PHILADELPHIA, PA.—Foreclosure sale of the Southwestern Street Railway Company and the Philadelphia & Chester Railway Company, which has been advertised for July 22 and 30, respectively, has been postponed by Judge Holland, of the United States Circuit Court, until September 21 and 22. The court also fixed the minimum price at which the Southwestern Company's property may be sold, at $300,000, and the lowest price at which the Philadelphia & Chester Company's property may be sold, at $225,000. The two companies form the trolley line extending from Front and Jackson Streets, this city, to Chester, and are part of the system of the Interstate Railways Company, the reorganization plan for which, as just announced, provides that the United Power and Transportation Company

agrees to pay all advances made on the bonds, which it is proposed to deposit for five years, in case the Interstate Company does not do so, and agrees to deposit securities as a guarantee for the proposed payments.

EL PASO, TEX.—The El Paso Electric Railway Company has contracted with the Stone & Webster Engineering Corporation for the construction of 7,180 feet of double track on Boulevard Street and for the double-tracking of 2,100 feet of park line, in El Paso, Texas. Eighty-pound seven-inch tee-rail will be laid on concrete foundation on Boulevard Street and Park Line will be laid with sixty-pound tee-rail. The contract includes the removal of 14,360 feet of old track.

LOGANSPORT, IND.—The Indiana Union Traction Company is measuring all of its lines from one end of the system to the other. The work was started from Muncie north, and the track measurements have been completed as far north on the Muncie-Bluffton line as Eaton. The work will require a good part of the summer, but when it is done the company will know definitely just how much trackage it owns. It is stated that the trackage is between 360 and 365 miles, single track.

DOYLESTOWN, PA.—Starting with $200,000, the upset price fixed by order of court, the property of the Philadelphia, Bristol & Trenton Street Railway Company, was knocked down at $380,000 to Carl N. Martin and John Redmond, of Philadelphia, representing the bondholders' committee, which holds $627,000 of the issue of $650,000 of bonds of the company. The sale means, it is said, a reorganization of the company and an improvement of the line from Philadelphia to Trenton.

CHARLESTON, W. VA.—A charter has been issued to the Kanawha and Ohio Valley Traction Company to build a line from Kanawha Falls, on the north side of the Kanawha River, to a point near Point Pleasant. The company is now having a survey made between Charleston and Kanawha Falls and construction of a line from Charleston to Dunbar, five miles northwest of this city will begin at once. The incorporators are Fred Paull Crosscup, George S. Couch and other prominent capitalists of this city.

NORWICH, CONN.—The Norwich, Colchester and Hartford Traction Company has completed all surveys and is ready to go ahead with construction work, which it expects to do within a month. It is hoped to have the first fifteen miles of the line in operation next year, and to complete the whole line in 1911. This will give a direct express trolley route between Norwich and Hartford in almost an air line. The distance will be forty miles, which is ten miles less than the steam-road distance between the two cities.

KANSAS CITY, MO.—The grading for the double-track steam and electric short line between Kansas City and St. Joseph —to be constructed by the Townsend-Enright syndicate—has been started near Lineville, in Platte County. It is also announced that work on the terminal system that is to be a part of the Kansas City-St. Joseph connecting railway will begin in September in the North Bottoms, above Kansas City, Kan., where the proposed Missouri River bridge is to be built. The plan includes a series of dikes to protect the property that has been acquired for railway purposes.

SEA VIEW, R. I.—For additional power on its railway lines, and for lighting several adjoining towns, including Narragansett Pier and Wickford, R. I., the Sea View Railroad Company has installed in its Hamilton, R. I., power station two 400-kilowatt Westinghouse turbines, driving Westinghouse three-phase, sixty-cycle, 360-volt alternators. This equipment is additional to a set of horizontal, cross-compound, reciprocating engines, driving Westinghouse generators, already installed. The plant is supplied with Westinghouse LeBlanc condensers, which preserve a vacuum of twenty-eight inches.

GUTHRIE, OKLA.—Work will be started on construction of the Mountain Valley and Plains Railroad at Cimmaron, N. M., on October 1; at Dalhart, Tex., on October 15, and at Guthrie on November 1. This announcement is made by H. S. Wannamaker, general manager, in charge of construction work at Aimstad, N. M. The people of Guthrie have raised a $75,000 bonus for this road. It was chartered last February, with $50,000, to build 195 miles from Higgins, Tex., to Guthrie, at an estimated cost of $2,000,000, providing an extension from Higgins, Tex., to Cimmaron, N. M., in the coal and timber fields of that section. C. M. Cogan, of Canton, Ohio, is one of the main promoters and backers of the new line.

NEW BRUNSWICK, N. J.—An electric road from New Brunswick to the Delaware is one of the possibilities under the plan of electrifying the New Brunswick and East Millstone Railroad, which has been discussed by the stockholders in this vicinity. The local stockholders have, it is said, received indirect intimation that the Pennsylvania Railroad Company, which owns a majority of the stock of this line, would not be averse to the plan if the expense could be met by bonding. At present the road extends only from this city to East Millstone, and while it runs through a well-populated section, is hardly long enough to get much passenger traffic. The railroad, however, owns a right-of-way twenty-four miles long, extending from East Millstone to the Delaware, following pretty closely the route of the Philadelphia & Reading line.

SPARTANBURG, S. C.—There is a proposition afoot for the building of an interurban trolley to connect Glenn Springs, fifteen miles distant, and Union, thirty miles distant, and General Manager F. H. Knox of the local electric power concern, J. B. Lee, president of the Glenn Springs hotel, and others are now formulating plans for the work. The road can be built with little grading and its construction is more probable at this time than most such companies at this early stage of the work. The route would open up a much traveled and popular line, used both in summer and winter seasons. L.

NORWALK, O.—Persistent rumors are being heard to the effect that negotiations are to be made which will result in the taking over of certain sections of the Cleveland, Southwestern & Columbus Railway by the Lake Shore Electric. It has been stated in Cleveland that it is proposed that the Lake Shore Electric shall take over the "green line" in Lorain, and that the latter would maintain its present main line through Elyria, but that the Lake Shore would operate the line between Lorain and Elyria, the west side belt line and the road to Amherst and Elyria connecting with the "green line" at the junction.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

RIPLEY, OKLA.—The Olive Grove Telephone Company has been incorporated here.

SALINA, KAN.—Frank Hageman has been granted a twenty-year telephone franchise here.

WALLHALLA, N. D.—J. F. Mager will put in over eighty miles of telephone line out of this city.

WELSH, LA.—The Planters' Telephone Company has been incorporated with a capital stock of $25,000.

ALBION, NEB.—The Albion Electric Light Company has been chartered with a capital stock of $30,000.

GILLETT, TEXAS—The Harmony Telephone Company has been incorporated by William Patton and others.

WEATHERFORD, OKLA.—The Farmers' Mutual Telephone Company has increased its capital stock to $10,000.

HAMMOND, OKLA.—The Hammond Central Telephone Company has been incorporated with a capital stock of $3,000.

STILLWATER, OKLA.—The Payne County Rural Telephone Company has been incorporated with a capital stock of $15,000.

LA PORTE, MINN.—The Farmers' Mutual Telephone Company has been incorporated as the La Porte and Vola Rural Telephone Company.

MILES CITY, MONT.—The Rocky Mountain Bell Telephone Company will shortly have long-distance connections with Butte, Helena and the West. C.

LEE, MASS.—A telephone line is being built into the town of Mount Washington from Copake, and a line is to be run from Great Barrington to the new Berkshire schools.

GREAT FALLS, MONT.—The Great Falls Automatic Telephone Company is having plans prepared for the erection of a two-story, reinforced concrete, fireproof exchange building to cost $25,000. C.

HUNTSVILLE, ALA.—The local branch of the Southern Bell Telephone Company is extending its line to many parts of the country, and in a short while the entire Tennessee Valley will have been webbed with telephones.

RALEIGH, N. C.—A charter has been granted today to the South East Guilford Telephone Company, of Greensboro. S. C. Jones, of that city, is a prominent stockholder, and numerous farmers in all parts of the country are subscribers.

JANESVILLE, WIS.—A deal is on foot here for the purchase by the Wisconsin Telephone Company of the Rock County Telephone Company with a view to consolidating the two exchanges. It is expected that the sale will be completed in the course of a few days.

PINE RIVER, MINN.—The wires have all been strung on the telephone line from this point to Emily and Outing, and the crew are installing telephones along the route. The total number of telephones includes those installed at Swanburg, Emily and Outing. It is expected that everything will be in working order within thirty days.

CHAMBERSBURG, PA.—The Garfield Telephone Company, composed of residents of that section of the county lying between Cheesetown and Salem Church, has been organized. The following are the officers: President, A. S. Thompson; secretary, Aaron Snoke; treasurer, John Ebersole. The company decided to build its line at once. This will make the seventh rural line connected with the Chambersburg exchange of the American

Union and the fifteenth in the county, Fayetteville having three, Shippensburg three, Waynesboro one and Greencastle one. During the week two other companies were started in Montgomery township.

MARSHALLTOWN, IOWA—At a meeting of the Farmers' and Merchants' Telephone Company the following officers were elected: A. G. Hawley, Clinton, president; B. F. Cummings, Marshalltown, vice-president; C. B. Cheadle, Joliet, Ill., secretary, and J. P. Cooper, Marshalltown, treasurer. The company will start work August 15 on improvements aggregating $50,000. C.

SHERIDAN, WYO.—H. Vance Lane, president of the Rocky Mountain Bell Telephone Company, after inspecting the proposed route from an automobile, has decided on the construction of a toll trunk line from Basin to this place, the line coming via Dayton and Shell Creek. This line, which is to be built this year, will for the first time give Sheridan direct trunk line telephone communication with Cheyenne.

SCOTTSBORO, ALA.—A farmers' telephone line will soon be connected with the telephone exchange of the Southern Bell Telephone Company at Bridgeport. The line will be constructed by R. C. Glover, and he has signed a contract with the Southern Bell Company. It will extend from Carpenter, where it connects with the Bell line, to Bryant, and later on to Smilax and Eliza on Sand Mountain, and will furnish service to about 1,500 subscribers when completed.

HOUSTON, TEX.—In accordance with the provisions of the charter by which the franchise secured by the Automatic Telephone Company was extended for a period of sixty days, the company has paid to the city the sum of $2,500. Under the terms of the extension this money was to be paid within thirty days after the passage of the extension ordinance, and the measure also provided that actual construction on the plant should begin within sixty days.

JACKSON, MISS.—The Mississippi Home Telephone Company, whose incorporation was reported some time ago, will immediately start active construction of its plant in this city, together with the toll lines to Meridian, Hattiesburg and other points. Plans are now being prepared for the main exchange building, which will be located at Pearl and Congress streets, and which will be of fireproof construction, adapted to the needs of the company. The apparatus and equipment throughout will be of the latest design in the telephone field.

HARRISBURG, PA.—The board of directors of the West Shore Telephone Company has elected the following directors: Dr. J. C. Stem, of Lemoyne, chairman; C. S. Willis, Lemoyne; Jacob Reiff, New Cumberland; S. S. Rupp, Shiremanstown, and Ernest H. Greenwood, Camp Hill. Mr. Greenwood announces that the switchboard and all the central-station apparatus had arrived, and that as soon as the switchboard is installed all present subscribers will be cut in to the West Shore exchange and the business handled over the present lines until the cable lines are completed. The company should therefore be in operation soon after the first of the month.

NEWBURYPORT, MASS.—In connection with the handsome new building of the Newburyport Central office of the New England Telephone and Telegraph Company just being erected, some very interesting figures of growth and development are given. In January, 1903, there were but 102 stations connected to this office; in January, 1909, the number of stations had increased to 1,241, or more than 300 per cent; and on the first of this month there were 1,352 stations. The present board is handling about 8,000 originating calls and about 700 toll calls per day. The new switchboard, which will be installed just as soon as the building is ready to receive it, can handle about 12,000 local calls per day and about 1,150 toll calls. By making additions to the board this number may be increased to 21,000 originating local calls and 1,900 toll calls per day—just about the growth that is figured for the next ten years.

TOLEDO, OHIO—The board of public safety of the city of Tiffin, Ohio, recently entered into a contract with the Central Union Telephone for a decided extension of signal service for the police department. A number of signal boxes will be installed at a rental of $2.25 per month. Negotiations are under way whereby it is expected that the control of the Lancaster Telephone plant, of Lancaster, Ohio, will be transferred in the near future to the Columbus Citizens' Telephone Company, of Columbus. A delegation of officials have completed an inspection of the plant and decided favorably to the purchase. Should the change be made extensive improvements will take place. Walter Wilcox, of Columbus, has been chosen general manager of the Home Telephone Company, of Portland, Ore., and with his wife will remove to that city about August 15. He was formerly teller at the Commercial Savings Bank, Columbus. The employes of the Toledo Railways & Light Company held their annual field day exercises on August 1 at the Casino, Toledo. Two performances were given in the theater and free tickets furnished to all employes and their families. The night men spent the morning and afternoon at the park and the day men enjoyed the evening. About 10,000 people were in attendance. H.

ELECTRICAL SECURITIES.

Industrials have still continued the feature of the market and have maintained strength right along with hardly any recessions in spite of the fact that professional traders have been inclined to hammer prices in a mild way, having discounted the chief bull features of the immediate moment, the settlement of the tariff, the certainty of bumper crops and the increase in business now going on.

The public, however, has not really appreciated these things and the results from them are yet to come. Consequently, although there may be setbacks for a while there is still bound to be further strength. This is well illustrated by the copper situation. Copper has been the weak spot in the market for quite a long time past. It is now likely to be one of the strong spots, owing to the increased consumption and diminished stocks. The outlook is quite healthy from every standpoint at the present moment.

General Electric stock has touched the highest point in the last four years. The company's gross sales are running at the rate of slightly better than $55,000,000 per annum, an improvement of forty per cent compared with a year ago. In regard to copper, the company has on hand sufficient stocks of copper to cover its requirements for fully six months to come. The company was a very heavy buyer of copper for two or three months in the spring, but has bought no large amounts of copper during the last three or four weeks. At the present rate of output the company requires between 50,000,000 and 55,000,000 pounds of copper per annum.

DIVIDENDS.

American Telegraph and Cable Company; regular guaranteed quarterly dividend of one-and-one-quarter per cent, payable September 1 to stock of record August 31.

Butte Electric and Power Company; the regular quarterly dividends of one-and-one-half per cent on the common stock and one-and-one-quarter per cent on the preferred stock of the company. Dividend on the common stock is payable October 1 to stockholders of record on September 15, and the dividend on preferred stock is payable November 1 to stockholders of record on October 15.

Kings County Electric Light and Power Company; a regular quarterly dividend of two per cent, payable September 1 to stock of record August 20.

Philadelphia Company; the regular semi-annual dividend of two-and-one-half per cent on the preferred stock, payable September 1 to stock of record August 10.

Gross earnings of the Brooklyn Rapid Transit for July showed a gain in gross of $189,000, a daily average of $6,300. This is the largest month's increase in several years.

NEW YORK.	Aug. 9.	Aug. 2.
Allis-Chalmers common	15¾	15⅝
Allis-Chalmers preferred	56¼	55
Amalgamated Copper	85⅝	84¾
American Tel. & Cable	....	80*
American Tel. & Tel.	142½	143¼
Brooklyn Rapid Transit	80½	79¼
General Electric	171¾	169¾
Interborough-Metropolitan common	15½	15¼
Interborough-Metropolitan preferred	48½	47½
Kings County Electric	....	125
Mackay Companies (Postal Telegraph and Cables) common	83½	83⅞
Mackay Companies (Postal Telegraph and Cables) preferred	74⅝	74
Manhattan Elevated	144⅝	145
Metropolitan Street Railway	....	19
New York & New Jersey Telephone	142	138
U. S. Steel common	77⅜	73⅞
U. S. Steel preferred	126¾	128
Western Union	75½	76½
Westinghouse common	88¾	85
Westinghouse preferred	....	120

*Last price quoted.

BOSTON.	Aug. 9.	Aug. 2.
American Tel. & Tel.	142¾	143⅛
Edison Elec. Illuminating	....	253
General Electric	....	169¾
Massachusetts Electric common	13	12½
Massachusetts Electric preferred	74½	74
New England Telephone	....	133½
Western Tel. & Tel. common	....	11¾
Western Tel. & Tel. preferred	90	89

PHILADELPHIA.	Aug. 9.	Aug. 2.
American Railways	47	45½
Electric Company of America	12½	12¼
Electric Storage Battery common	61¾	62½
Electric Storage Battery preferred	61¾	62½
Philadelphia Electric	12½	12
Philadelphia Rapid Transit	31⅜	30½
Philadelphia Traction	91¼	90⅝
Union Traction	55⅜	55

CHICAGO.	Aug. 9.	Aug. 2.
Chicago Railways, Series 1	112	....
Chicago Railways, Series 2	39	39¼
Chicago Subway	23½	19½
Chicago Telephone	135	134
Commonwealth Edison	120⅛	120⅛
Metropolitan Elevated common	....	18
Metropolitan Elevated preferred	50	48¾
National Carbon common	98	92
National Carbon preferred	120	119

NEW MANUFACTURING COMPANIES.

(Special Correspondence.)

PIERRE, S. D.—The Hill Electric Welding Company has been incorporated with a capital stock of $25,000.

ST. LOUIS, MO.—The Gas and Appliance Company has been incorporated. Incorporators: Oliver H. Fyfe and Joseph S. Lehman, one share each; Irwin Lehman, 498. Capital stock, fully paid, $20,000.

WILMINGTON, DEL.—The Electric Ampliphone Company has been incorporated, with a capital of $250,000, by G. M. Wallace, Camden, N. J.; P. J. Dougherty, Philadelphia, Pa., and T. Ritchie, Wilmington.

NEW YORK, N. Y.—The Universal Trolley Retriever Company, Manhattan, has been incorporated, to manufacture trolley wheels, etc.; capital, $100,000. Incorporators: Peter J. Minck, Brooklyn; F. C. MacLean, Freneau, N. J.; Paul A. Zizelman, New York city.

NEW YORK, N. Y.—C. F. Splitdorf has been incorporated to manufacture electrical machinery, ignition apparatus, automobile parts and sundries, with a capital of $500,000. The incorporators are: C. F. Splitdorf, J. Splitdorf, New York city, and P. J. W. Kelley, Jersey City, N. J.

CAMDEN, N. J.—The Electric Accumulator Company, 419 Market Street, Camden, N. J., has been incorporated to manufacture electrical accumulators, undulating current generators and electrical machinery, etc.; capital, $200,000. Incorporators: F. W. Reeves, W. L. Meck and C. Duffy, all of Camden.

NEW YORK, N. Y.—The Electric Installation Company has been incorporated to do electrical work of all kinds; capital, $20,000. Incorporators: William C. Pratt, 30 Pine Street; Arthur J. Pates, 51 West One Hundred and Sixth Street; Phanor J. Eder, 80 William Street, all of New York.

LAFAYETTE, IND.—The George L. Fish Electric Company has been organized and incorporated to manufacture all kinds of electric appliances and devices; also, equipment for electric power plants. The company's factory is being installed in this city and will be ready for operation in a few days. George L. Fish, John F. McHugh and W. F. Frey, directors. S.

TACOMA, WASH.—Articles of incorporation of the Northwestern Electric Company have been filed in the county auditor's office by City Electrician F. H. Lauzon, E. L. Hollingshead, H. D. Nowlin, F. McFarland and J. P. Covert, who are named as members of the board of directors. The stated purpose of the corporation is to conduct a general manufacturing business, buying, leasing and acquiring patents and patent rights, the products of manufacture and maintaining factories and foundries. The capital stock is $500,000.

PERSONAL MENTION.

F. STEINHARDT, of the Cuban General Electric Company, arrived in New York from Havana last week.

L. B. CRAMER has succeeded H. Milliken as electrical engineer of the Oregon Electric Company, of Portland, Ore.

WALTER G. OAKMAN, president of the Hudson Companies, sailed for Europe last Tuesday on the Kaiser Wilhelm II.

J. LUNT, astrophysical assistant at the Cape Observatory, has been given the honorary degree of D. Sc., by the University of Manchester.

FREDERICK W. WHITRIDGE, receiver of the Third Avenue Railroad Company, of New York city, was a passenger on the Lusitania last week.

CHAIRMAN WILLIAM R. WILCOX, of the New York Public Service Commission, will sail for New York, August 24, on the Kaiser Wilhelm der Grosse.

PROF. KARL RUNGE, of the department of mathematics in the University of Göttingen, Germany, has been appointed Kaiser Wilhelm professor at Columbia University for next year.

HERR S. EYDE has been awarded a silver medal by the Royal Society of Arts, London, Eng., for his paper on "The Manufacture of Nitrates from the Atmosphere by the Electric Arc."

W. E. ELLIOTT has been elected treasurer of the Pacific States Electric Company, of San Francisco. Mr. Elliott was formerly secretary and treasurer of the California Electrical Works of the same city.

J. T. WOOD, president of the South Shore Traction Company and prominently identified with a number of other corporations, was married by special license at Holy Trinity Church, London, on August 3, to Mrs. Joseph Hicks-Beach of New York city.

LIEUT. TREVOR DAWSON delivered the first Gustave Canet lecture on June 30 last, at the twenty-fifth anniversary meeting, in London, Eng., of the Junior Institution of Engineers. The lecturer is the recipient of the first gold medal, which is to be awarded every fourth year by Madame Canet in memory of her husband, the award being made through the council of the institution.

A. N. FOX, manager of the publicity department of the Benjamin Electric Manufacturing Company, of Chicago, has returned from a two weeks' invasion of the lakes in Michigan. He reports good fishing. Incidentally he has collected a few good stories and taken on a four-ply coat of tan.

J. H. McGILL, president of the Crescent Company, Valparaiso, Ind., returned to Chicago last week after a trip East looking after his large lines there. Mr. McGill reports business good and has taken on the agency for two strong lines, the American Conduit Company, of Pittsburg, and the Lowell Insulated Wire Company, of Lowell, Mass.

OBITUARY.

JOHN C. FREY, Red Bank, N. J., secretary to Vice-President Hall, of the Bell Telephone Company, for the past twenty-four years, died on August 5, after a brief illness. He was forty-six years old. He is survived by his widow. Before coming to New York he was a court stenographer at his home in the city of Wilkesbarre, Pa.

WILLIAM WARREN LYON, JR., an electrical engineer of the New York Public Service Commission, died on July 31, at the home of his parents, 157 West Ninety-second Street, New York city. He was graduated from Columbia in 1906. Mr. Lyon was a member of the Theta Chi fraternity and the American Institute of Electrical Engineers.

INDUSTRIAL ITEMS.

THE NEW YORK INSULATED WIRE COMPANY, New York, N. Y., is distributing two advertising blotters giving some timely hints on the selection of wires and insulating tapes.

ROBERT WHELAN & COMPANY, 839 Monadnock Block, Chicago, Ill., are the manufacturers of a very practical and ingenious form of shaking and dumping grate. Information concerning this grate will be sent to those interested upon request.

THE AMERICAN PLATE GLASS COMPANY, at Kane, Pa., is installing a 700-horsepower Westinghouse horizontal gas engine for power purposes, and has also just contracted for a sixteen-inch by twenty-six-inch, twin-tandem, horizontal Westinghouse engine, to be direct-connected to a 400-kilowatt generator.

THE DU BOIS IRON WORKS, Du Bois, Pa., has issued Catalogue No. 32 on Du Bois steam and power pumps for every service. These comprise steam, electric, gasoline-engine and air-driven types. The catalogue is handsomely illustrated and is replete with much useful information of value to pump users.

THE HILL CLUTCH COMPANY, Cleveland, Ohio, has just published a booklet, entitled "A-B-C Engineering," the first of a series of similar publications, this one being devoted to line-shaft bearings in general and to the Hill collar oiling bearing in particular. Copies will be forwarded by the company on request.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., is distributing a new flyer descriptive of its automobile electric-lighting specialties, consisting of connectors, flush receptacles and plugs, limousine switches and two-point round switches. This flyer should be of interest to all owners or users of automobiles.

THE CENTRAL LABORATORY AND SUPPLY COMPANY, J. W. Esterline, manager, has secured a contract for the installation of an engine and generator, including the equipment, and for 848 motors in the C. H. Campbell Company's factory in Shelbyville, Ind. This is one of the largest contracts this quite new firm has undertaken. S.

THE H. T. PAISTE COMPANY, Philadelphia, Pa., has issued the July number of its monthly bulletin and price list (Bulletin 68), which goes by the name of "Paistery," describing and illustrating the Paiste "Triple-Six-Fifty" sockets and Paiste "Panelettes," types A, B and C, etc. All these products are National Electrical Code standard.

THE CHARLES L. KIEWERT COMPANY, Milwaukee, Wis., has issued two booklets describing its two flaming-arc lamps, the "Aurola" and the "Alba." Some of the features emphasized in these booklets are the feeding mechanism on top, completely isolated and protected against products of combustion; the simple carbon holder suspension, and arc in fixed position and very small feeding periods insuring steady light and maximum of luminous efficiency.

THE AMERICAN ELECTRICAL HEATER COMPANY, Detroit, Mich., has issued Catalogue 25 on "American Electric Heating Devices." These devices include air heaters, annealers, baking ovens, bar urns, branders, bust formers (for corset manufacturers), chafing dishes, cigar branders, coffee pots, cooking ovens, cork branders, curling-iron heaters, disk stoves, foot warmers, glue pots, griddles, hair driers, hot plates, hot-water urns, instrument sterilizers, irons for all purposes, percolators,

plate warmers, radiators, soldering irons, solder pots, sweating blankets, teakettles, warming pads, water heaters, wood benders, and many other electric apparatuses and accessories too numerous to mention. A price list is inserted.

THE LORD ELECTRIC COMPANY, New York, N. Y., has just received a very substantial order for Earll catchers and retrievers as the result of a service test of eight months. This is added to the list of other large properties using these devices exclusively. Those interested in retrievers and catchers will be furnished information as to this equipment or as to other representative users.

THE WESTERN ELECTRIC COMPANY, Chicago, Ill., is distributing a booklet entitled "Gray Registers for Measured Telephone Service," which tells why Gray registers reduce the operator's load, their possibilities, why they pay, etc. These registers are made by The Gray Telephone Pay Station Company, Hartford, Conn., for which the Western Electric Company is the accredited selling agent.

THE OKONITE COMPANY, New York, N. Y., has issued an instructive folder entitled "Economy." Starting with a dissertation on the meaning of the word economy the folder proceeds logically to demonstrate the economy of using Okonite and Manson tapes, with especial regard to the low cost of making joints and the greatly reduced necessity for renewals. An illustrated article gives explicit instructions for making an Okonite joint.

THE HURON LIGHT AND POWER COMPANY, of Huron, S. D., has given the contract to the Minneapolis Steel and Machinery Company for furnishing the new engines for its electric-light plant. It will install one 100-horsepower and one 150-horsepower Muenzel producer-gas engine, together with two 150-horsepower Muenzel gas-producers, to replace the present steam equipment. Both of the engines will be belted to alternating-current generators.

THE SPENCER WIRE COMPANY, Worcester, Mass., has just contracted to duplicate its present installation of a 200-horsepower Westinghouse vertical gas engine and a 250-horsepower Westinghouse suction producer plant, to meet the power needs of its factory. The engine will be direct-connected to a 135-kilowatt, three-phase, 440-volt, 60-cycle alternator, similar to that now running. The initial equipment was but recently installed and is representative of the most improved producer-plant practice for a moderate capacity.

THE MANUFACTURERS' PUBLICITY CORPORATION has been formed in New York, N. Y., to take charge of the advertising interests of the clients of the respective parties who have organized the new company and in order to widen the scope and strength of their activities. The officers of the corporation are Benjamin R. Western, president; Walter Mueller, vice-president and general manager; W. H. Denney, treasurer; W. Hull Western, secretary. The offices are located at the Hudson Terminal Building, 30 Church Street, New York city.

Directory of Electrical and Allied Engineering and Scientific Societies.

(Published in the second issue of each month.)

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary, Lloyd Lyon, secretary and auditor Mobile Light and Railway Company, 158 Government Street, Mobile, Ala.

AMERICAN ASSOCIATION OF ELECTRIC MOTOR MANUFACTURERS. Secretary, W. H. Tapley, 29 West Thirty-ninth Street, New York, N. Y.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Dr. J. W. Richards, Bethlehem, Pa.

AMERICAN ELECTROTHERAPEUTIC ASSOCIATION. Secretary, Dr. Albert C. Geyser, 352 Willis Avenue, New York city.

AMERICAN FOUNDRYMEN'S ASSOCIATION. Secretary, Dr. Richard Moldenke, Watchung, N. J.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, Ralph W. Pope, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

AMERICAN INSTITUTE OF MINING ENGINEERS. Secretary, Rossiter W. Raymond, 29 West Thirty-ninth Street, New York city.

AMERICAN MATHEMATICAL SOCIETY. Secretary, F. N. Cole, 50 West 116th Street, New York city.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION. Secretary, J. W. Taylor, Old Colony Building, Chicago, Ill.

AMERICAN ROENTGEN-RAY SOCIETY. Secretary, Dr. G. C. Johnson, 514 Bijou Building, Pittsburg, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York city.

AMERICAN SOCIETY OF CIVIL ENGINEERS. Secretary, Charles Warren Hunt, 220 West Forty-seventh Street, New York city.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Secretary, A. P. Folwell, Flatiron Building, New York city.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, B. V. Swenson, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary, H. E. Weeks, secretary and treasurer Tri-City Railway Company, Davenport, Iowa.

AMERICAN STREET AND INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION. Secretary, B. B. Davis, claim agent Columbus Railway and Light Company, Columbus, Ohio.

AMERICAN STREET AND INTERURBAN RAILWAY ENGINEERING ASSOCIATION. Secretary, J. W. Corning, electrical engineer Boston Elevated Railway Company, Boston, Mass.

AMERICAN STREET AND INTERURBAN RAILWAY TRANSPORTATION AND TRAFFIC ASSOCIATION. Secretary, B. V. Swenson, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

AMERICAN STREET AND INTERURBAN RAILWAY MANUFACTURERS' ASSOCIATION. Secretary, George B. Keegan, 2321 Park Row Building, New York city.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, J. E. Cowles, superintendent of lighting Hot Springs Light and Railway Company, Hot Springs, Ark.

ARKANSAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Charles F. Speed, Texarkana, Ark.

ASSOCIATION OF CAR-LIGHTING ENGINEERS. Secretary, G. B. Colegrove, Illinois Central Railroad, Chicago, Ill.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, D. L. Huntington, second vice-president and manager Washington Water Power Company, Spokane, Wash.

ASSOCIATION OF EDISON PURCHASING AGENTS. Secretary, J. W. Brennan, Edison Illuminating Company, Detroit, Mich.

ASSOCIATION OF ELECTRIC LIGHTING ENGINEERS OF NEW ENGLAND. Secretary, W. H. Cole, Waltham, Mass.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, G. H. Winslow, Frick Building Annex, Pittsburg, Pa.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, Minnesota, St. Paul & Sault Ste. Marie Railroad, Chicago, Ill.

CALIFORNIA ELECTRIC RAILWAY ASSOCIATION. Secretary, L. E. W. Pioda, Oak and Broderick streets, San Francisco.

CALIFORNIA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, P. T. Whittier, Spencer, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Secretary, T. S. Young, Toronto, Canada.

CANADIAN STREET RAILWAY ASSOCIATION. Secretary, Acton Burrows, 33 Melinda Street, Toronto, Ontario.

CENTRAL ELECTRIC RAILWAY ASSOCIATION. Secretary, A. L. Neereamer, Traction Terminal Building, Indianapolis.

CENTRAL ELECTRIC TRAFFIC ASSOCIATION. Secretary, J. T. Brittson, assistant claim agent Chicago, South Bend & Northern Indiana Railway Company, South Bend, Ind.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary, J. C. Lawler, Colorado Springs, Colo.

CONNECTICUT STATE STREET RAILWAY ASSOCIATION. Secretary, F. W. Poole, Bridgeport, Conn.

ELECTRIC CLUB OF CHICAGO. Secretary, Wm. S. Taussig, 204 Dearborn Street, Chicago, Ill.

ELECTRIC CLUB OF CLEVELAND. Secretary, George L. Crosby, 1200 Schofield Building, Cleveland, Ohio.

ELECTRICAL CLUB OF CALIFORNIA. Secretary, Russell D. Holabird, Argonaut Hotel, San Francisco, Cal.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, George William Russell, Jr., 500 Fifth Avenue, New York city.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, Charles J. Sutter, 1220 Pine Street, St. Louis, Mo.

ELECTRICAL TRADES ASSOCIATION OF CANADA, LIMITED. Secretary, William R. Staveley, Royal Insurance Building, Montreal, Canada.

ELECTRICAL TRADES ASSOCIATION OF CHICAGO. Secretary, Frederick P. Vose, Marquette Building, Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF PHILADELPHIA. Secretary, E. A. Symmes, 810 Drexel Building, Philadelphia.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, San Francisco, Cal.

ELECTRICAL TRADES SOCIETY OF NEW YORK (Member National Electrical Trades Association). Secretary, Franz Neilson, 80 Wall Street, New York city.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 154 Nassau Street, New York city.

ENGINE BUILDERS' ASSOCIATION OF THE UNITED STATES. Secretary, J. I. Lyle, 39 Cortlandt Street, New York city.

ENGINEERS' CLUB OF PHILADELPHIA. Secretary, H. G. Perring, 1317 Spruce Street, Philadelphia, Pa.

ENGINEERS' SOCIETY OF MILWAUKEE. Secretary, W. Fay Martin, Milwaukee, Wis.

FLORIDA ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, G. F. Doig, Gainesville, Fla.

ILLINOIS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, C. A. Camp, Henry, Ill.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Ottawa, Ill.

ILLUMINATING ENGINEERING SOCIETY. Secretary, Preston S. Millar, Engineering Societies Building, 33 West Thirty-ninth Street, New York city.

INDEPENDENT TELEPHONE ASSOCIATION OF TEXAS AND LOUISIANA. Secretary, C. A. Shock, Sherman, Tex.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Frederic Leslie, Muncie, Ind. Next meeting, August 18 and 19, French Lick Springs, Ind.

INDIANA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Allen J. Paylow, Rockport, Ind.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, Frank P. Foster, Corning, N. Y. Annual convention, Atlantic City, N. J., September 14-16.

INTERNATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary, A. C. Davis, Parkersburg, W. Va.

IOWA ELECTRICAL ASSOCIATION. Secretary, W. N. Keiser, Des Moines, Iowa.

IOWA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. J. Thill, Des Moines, Iowa.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, L. D. Mathes, Dubuque, Iowa.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary, James D. Nicholson, Newton, Kan.

KENTUCKY INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. G. Turpine, Henderson, Ky.

MAINE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, M. E. Crow, Houlton, Me.

MAINE STREET RAILWAY ASSOCIATION. Secretary, E. A. Newman, 471 Congress Street, Portland, Me.

MASSACHUSETTS STREET RAILWAY ASSOCIATION. Secretary, Charles S. Clark, 70 Kilby Street, Boston, Mass. Meets second Wednesday of each month, except July and August.

MASTER CAR BUILDERS' ASSOCIATION. Secretary, J. W. Taylor, 390 Old Colony Building, Chicago, Ill.

MICHIGAN ELECTRIC ASSOCIATION. Secretary, A. C. Marshall, Port Huron, Mich. Annual convention, Detroit, Mich., August 17, 18 and 19.

MICHIGAN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, A. A. Burch, Battle Creek, Mich.

MINNESOTA ELECTRICAL ASSOCIATION.. Secretary-treasurer, B. W. Copperthwait, Faribault, Minn.

MISSISSIPPI ELECTRICAL ASSOCIATION. Secretary, J. Abbott, manager Jackson Electric Railway, Light and Power Company, Jackson, Miss.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATERWORKS ASSOCIATION. Secretary, Claude L. Clary, Sikeston Electric Light and Power Company, Sikeston, Mo.

MISSOURI INDEPENDENT TELEPHONE ASSOCIATION. Secretary, George W. Schwerer, Windsor, Mo.

MUNICIPAL LIGHTING ASSOCIATION OF MASSACHUSETTS. Secretary, J. C. Norcross, Reading, Mass.

NATIONAL ARM, PIN AND BRACKET ASSOCIATON. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, W. H. Morton, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL TRADES ASSOCIATION. Secretary, Frederick P. Vose, 1343 Marquette Building, Chicago, Ill.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, Frank M. Tait, Dayton, Ohio.

NEBRASKA ELECTRICAL ASSOCIATION. Secretary, Frank McMaster, Beatrice, Neb.

NEBRASKA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. E. Mattison, Lincoln, Neb.

NEW ENGLAND ELECTRICAL TRADES ASSOCIATION. Secretary, Alton F. Tupper, 60 State Street, Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, John J. Lane, 12 Pearl Street, Boston, Mass. Meetings held on fourth Thursday of each month.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

NEW YORK RAILROAD CLUB. Secretary, H. D. Vote, 95 Liberty Street, New York, N. Y.

NEW YORK STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. Max Eaton, Niagara Falls, N. Y.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, N. W. Brockett, Cataract Building, Seattle, Wash.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Ralph Reamer, Columbus, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, David Gaehr, Schofield Building, Cleveland, Ohio.

OHIO STREET RAILWAY ASSOCIATION. Secretary, Charles Currie, Akron, Ohio.

OKLAHOMA ELECTRIC LIGHT, RAILWAY AND GAS ASSOCIATION. Secretary, Galen Crow, Guthrie, Okla.

OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION. Secretary, Frank J. Scherrer, 195 Broadway, New York city. Annual reunion, Pittsburg, Pa., August 17-19.

ORDER OF THE REJUVENATED SONS OF JOVE. Mercury, C. B. Roulet, Dallas, Tex.

PACIFIC COAST ELECTRIC TRANSMISSION ASSOCIATION. Secretary, Samuel G. Reed, Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION. Secretary, E. L. Smith, Towanda, Pa. Annual convention, Eagles Mere, Pa., September 8, 9 and 10.

PENNSYLVANIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, H. E. Bradley, 135 South Second Street, Philadelphia, Pa.

PENNSYLVANIA STATE STREET RAILWAY ASSOCIATION. Secretary, Charles H. Smith, Lebanon, Pa.

PIKE'S PEAK POLYTECHNIC SOCIETY. Secretary, E. A. Sawyer, Colorado Springs, Colo. Meetings, second Saturday of each month.

RAILWAY SIGNAL ASSOCIATION. Secretary, C. C. Rosenberg, Bethlehem, Pa. Next annual meeting, Louisville, Ky., October 12-14, 1909.

SOCIETY OF AUTOMOBILE ENGINEERS. Secretary, Alexander Churchward, 30 Church Street, New York city.

SOCIETY OF WIRELESS TELEGRAPH ENGINEERS. Secretary, C. E. Russell, Boston, Mass.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Arthur L. Williston, Pratt Institute, Brooklyn, N. Y.

SOUTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer. E. R. Buck, Hudson, S. D.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, E. T. Moore, Dallas, Tex.

STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK. Secretary, J. H. Pardee, J. G. White & Company, New York city.

TEXAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, T. A. Gould, Ennis, Tex.

UNDERWRITERS' NATIONAL ELECTRIC ASSOCIATION. Secretary Electrical Committee, C. M. Goddard, 55 Kilby Street, Boston, Mass.

VERMONT AND NEW HAMPSHIRE INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. B. Seeley, St. Johnsbury, Vt.

VERMONT ELECTRICAL ASSOCIATION. Secretary, C. C. Wells, Middlebury Electric Light Company, Middlebury, Addison County, Vt.

VIRGINIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, B. L. Fisher, Rocky Mount, Va.

WESTERN SOCIETY OF ENGINEERS (Electrical Section). Chairman, William B. Jackson, 115 Adams Street, Chicago, Ill.; secretary, J. H. Warder, Monadnock Block, Chicago, Ill.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 382 Ohio Street, Chicago, Ill. Annual convention, Detroit, Mich., October 26-28, 1909.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, John S. Allen, Lake Geneva, Wis.

WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. C. Crowley, Jr., Superior, Wis.

DATES AHEAD.

Michigan Electric Association. Annual convention, Detroit, Mich., August 17-19.

Old-Time Telegraphers' and Historical Association. Annual reunion, Pittsburg, Pa., August 17-19.

Indiana Electric Light Association. Next meeting, French Lick Springs, Ind., August 18 and 19.

Northwest Electric Light and Power Association. Annual convention and joint session with Seattle branch, A. I. E. E., Seattle, September 7-9.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 8-10.

International Association of Municipal Electricians. Annual convention, Atlantic City, N. J., September 14-16.

Kansas Gas, Water, Electric Light and Street Railway Association. Next meeting, Wichita, Kan., September 23-24.

American Street and Interurban Railway Association. Annual convention, Denver, Colo., October 4-9.

Colorado Electric Light, Power and Railway Association. Annual convention, Denver, Colo., October 7, 8 and 9.

Railway Signaling Association. Annual meeting, Louisville, Ky., October 12-14.

Western Association of Electrical Inspectors. Annual meeting, Detroit, Mich., October 26, 27 and 28.

American Association of Electric Motor Manufacturers. Next meeting, St. Louis, Mo., November 15 and 18.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) July 27, 1909.

928,933. LOW-WATER ALARM FOR STEAM-BOILERS. Charles Brent, Brandon, Manitoba, Canada. Filed November 5, 1906. A thermostatic device surrounding a head in open communication with the boiler is adapted when the head is converted into a steam head to ring an electric alarm.

928,934. CONTACT DEVICE. Charles Brent, Brandon, Manitoba, Canada. Filed November 5, 1906. A loop-shaped thermostatic bar when heated makes an electric circuit.

928,936. ELECTRIC HEATER FOR CURLING-IRONS. Mary M. Buck, Machias, N. Y. Filed August 12, 1908. In combination with electrical heating means, are coin-controlled circuit closing means and thermostatic devices for opening the circuit-closing means.

928,937. GAS-SUPPLY ALARM. Louis C. Bulkley, Benton, La. Filed November 20, 1908. Operates when a thermostatic member expands through heating.

928,963. BATTERY-CONTACT. Julius H. Gugler, Minneapolis, Minn., assignor to the Battery Company, Milwaukee, Wis. Filed July 25, 1908. The electrode has a metallic contact cup seated therein, and electroplating electrically connects the upper portion of the cup to the upper portion of the electrode.

928,989. TELEPHONE-CABINET. Alfred Larsson, Buffalo, N. Y. Filed August 21, 1907. Has a back constructed of sheet metal to form a flat upper part, a rearwardly dished lower part and a rearwardly projecting marginal flange, and a movable hood arranged in front of the dished part of the desk.

928,998. ELECTRIC-FUSE CASE. Thomas E. Murray, New York, N. Y. Filed September 28, 1908. A wrapping of non-combustible material surrounds the fuse over a portion of its length, and a body of inert and refractory pulverized material completely fills the case of fictile material and surrounds the fuse and wrapping.

928,999. ELECTRIC CUT-OUT. Thomas E. Murray, New York, N. Y. Filed December 30, 1908. Comprises a base having a socket and circuit terminals therein, a fuse plug constructed to enter and fit the socket and make contact with the terminals, a fuse-plug holder closing the socket, and a device for detachably connecting the plug and holder.

929,001. RHEOSTAT. Ralph E. Noble and Louis E. Mitchell, Chicago, Ill., assignors to Morgan-Gardner Electric Company, Chicago, Ill. Filed February 5, 1909. Resistance grids are mounted in slides adapted to engage in slideways in a rack or frame.

929,011. ELECTROMAGNETIC WINDING-GEAR FOR CLOCKS AND THE LIKE. Karl Puttkammer, Gross-Lichterfelde, near Berlin; Friedrich Orthmann, Charlottenburg, and Julius Schindler, Berlin, Germany, assignors to the firm of Normal-Zeft Gesellschaft mit beschränkter Haftung, Berlin, Germany. Filed December 5, 1907. Power is transmitted to the clock work-spindle driving member by a U-shaped armature.

929,017. METAL-DEPOSITING APPARATUS. James K. Reynard, East Elmhurst, N. Y. Filed February 14, 1906. A vacuum chamber has a bottom with an opening, a rotatable stem passes downwardly from the interior of the chamber and is adapted to support a record, and a cup on the stem contains a fluid sealing the opening.

929,025. TELEPHONE-STAND. Charles R. Schafer, Syracuse, N. Y. Filed March 24, 1908. The receiver is clamped to a vertical arm supported by a horizontal arm.

929,041. CONTROLLER ATTACHMENT. John Sontag, West New York, N. J. Filed October 17, 1908. The contact finger has a contact face, provided at its end with a recess containing an insulating material.

929,043. SELECTIVE MECHANISM. Louis B. Spencer, Ogden, Utah. Filed October 29, 1908. Comprises a number of operating devices, a greater number of selectively operated devices, each corresponding to a different one of the groups in which the operating devices may be actuated, and means by which movement of any group of the operating devices causes movement of the corresponding operated device.

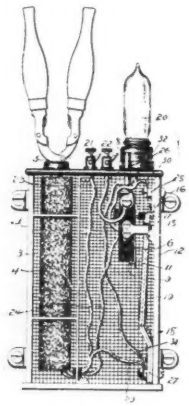
929,055. PRESSURE-GOVERNING APPARATUS. Walter V. Turner, Edgewood, Pa., assignor to the Westinghouse Air Brake Company. Filed November 1, 1907. In combination with a supply pipe and two or more reservoirs for supplying air to it, is an electric regulating mechanism governed by pressure in the supply pipe for controlling the supply of air from the reservoirs to the supply pipe.

929,069. ELECTRIC-LIGHT-CONTROLLING DEVICE. Arthur L. Wood, Jacksonville, Ill. Filed July 8, 1908. A clock is arranged to make electric contacts at certain times.

929,094. ILLUMINOUS ELECTRIC HEATER. Frank Kuhn, Detroit, Mich., assignor to American Electrical Heater Company. Filed December 12, 1908. A series of electric lamps project upwardly from a base.

929,095. ELECTRIC HEATER. Frank Kuhn, Detroit, Mich., assignor to American Electrical Heater Company. Filed March 22, 1909. An electrical heater comprises a hot plate having a heating unit secured to its under side, and a casing surrounding the unit and spaced therefrom has a marginal supporting bearing for the plate, and forming an air chamber on its under side.

929,097. OUTLET OR JUNCTION BOX. George A. Lutz, New York, N. Y., and Clarence C. Sibley, Perth Amboy, N. J. Filed November 29, 1905. Has a number of socket members having open tops and ends and extending inwardly from the wall of the box adapted to receive conduits, and a cover for the box.



928,936.—ELECTRIC HEATER FOR CURLING-IRONS.

929,118. BATTERY-SUPPORTING MECHANISM. Tracy V. Buckwalter, Altoona, Pa. Filed January 20, 1909. A frame for holding the battery has elastic hangers having three points of connection with the frame above the center of gravity thereof.

929,121. STORAGE BATTERY. Rufus N. Chamberlain, Depew, N. Y., assignor to Gould Storage Battery Company. Filed October 9, 1906. The battery plates are arranged alternately positive and negative, an outside plate being a positive and having substantially greater capacity than either side of the inside positive plates of the cell.

929,123. ELECTRIC METER. Thomas Duncan, La Fayette, Ind., assignor to Duncan Electric Manufacturing Company, La Fayette, Ind. Filed February 1, 1909. An integrating wattmeter is supplied with a supplemental field winding normally forming no field coil portion of the meter, and manually controlled means are provided for bringing the supplemental field winding into and out of operating relation with the meter armature, in order that the meter may be operated to test its speed.

929,128. TELEPHONE ATTACHMENT. Howard F. Hansell, Jr., Philadelphia, Pa. Filed February 4, 1909. In combination with an upright support, is an elongated bracket or arm fixedly secured thereto between its ends, and a receiver is fixedly secured at one end of the bracket and a transmitter fixedly secured at the other end thereof.

929,132. INSULATOR. Ernest R. Hill, East Orange, N. J. Filed May 25, 1908. Describes an insulator of the form shown in the illustration.

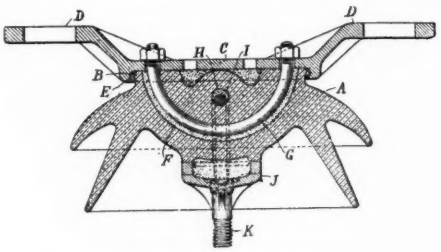
929,133. ELECTRIC SELECTING MECHANISM. Henry C. Horstmann, Chicago, Ill., assignor of one-fourth to Samuel Evans and one-fourth to John Howard McElroy, Chicago, Ill. Filed September 16, 1908. In combination with a cylinder and means for rotating it, are a number of electrically-controlled clutches adapted to grip the cylinder, actuating elements attached to the clutches, a number of circuits, one for each clutch, and means for selectively energizing the circuits to engage the various clutches with the cylinder and move the associated actuating elements.

929,151. AUTOMATIC REFRIGERATING APPARATUS. Robert F. Massa, Chicago, Ill. Filed July 9, 1906. An electrically-actuated thermostatically-controlled device controls means located between the condenser and refrigerating coil for controlling the admission of the refrigerant to the coil.

929,185. ALTERNATING-DIRECT-CURRENT SYSTEM OF CONTROL. Howard L. Beach, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed March 3, 1906. A change-over switch is provided whereby the circuits of the system may be arranged for operation of a device by either alternating or direct current, also relay switches whereby the circuits of the controlling magnet windings are governed.

929,186. SYSTEM OF ELECTRIC-MOTOR CONTROL. Howard L. Beach, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed September 26, 1907. Means, dependent upon the interruption of the circuit in which a transformer is included, are provided for automatically affecting the separation of the current-collecting device (connecting one extremity of the transformer with the supply circuit) from the supply circuit.

929,187. CONTROL SYSTEM FOR ELECTRIC MOTORS. Howard L. Beach, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed November 8, 1907. In combination with a number of motors, are control switches therefor, operating magnets for the switches, secondary batteries to energize the magnets, means for charging the batteries from unlike sources of energy, and automatic means for selecting one of these means.



929,132.—INSULATOR.

929,256. ELECTROMAGNET. Albert E. Sink, New York, N. Y. Filed January 25, 1909. An electromagnet coil is provided with a composite wire comprising a number of insulated strands intertwined longitudinally, this composite wire being wound to form a coil, and a resistance is provided in closed circuit with one of the strands.

929,262. ELECTRIC IGNITER FOR EXPLOSION-ENGINES. Walter C. Thornhill, Minneapolis, Minn., assignor of one-half to Charles W. Gardner, Minneapolis, Minn. Filed August 26, 1907. A movable spring-influenced electrode carries an arm positioned to be engaged by a part of the piston and also an arm to contact with the stationary electrode.

929,269. ELECTROMAGNET FOR CLOCKS AND MOTORS. Carolus Arnold, Hamburg, Germany. Filed May 11, 1908. Has a resistance arranged in the form of an inductionless double coil of opposite directions upon the magnet coils directly, to minimize the effects of induction set up in breaking the circuit.

929,276. ELECTROLYTIC DIAPHRAGM AND METHOD OF MAKING THE SAME. Anson G. Betts, Troy, N. Y. Filed January 7, 1909. A diaphragm for use in aqueous electrolytes is composed of asbestos having its fibers cemented together with sulphur.

929,280. LAMP. Edward C. Broadwell and John A. Lyons, Chicago, Ill. Filed March 18, 1905. The filament comprises a thread of porous metallic chromium and metallic oxides contained within the pores of the thread, and a mantle of earth oxides inclosing but out of contact with the same.

929,284. THIRD-RAIL OR OTHER ELECTRICAL CONDUCTOR. William J. J. Burch, Chicago, Ill. Filed January 7, 1907. Has central parallel, downwardly directed flanges, supporting means engaged between the flanges (the flanges having concaved contact faces), the outwardly directed supporting flanges integral with the rail and an insulating covering thereon.

929,312. ELECTROPLATING PLANT. Willis R. King, Newark, N. J., assignor to the Hanson and Van Winkle Company. Filed November 13, 1908. Describes in detail a plant for electroplating extraordinarily long pieces of metallic material.

929,319. RELAY. Frank R. McBerty, New Rochelle, N. Y., assignor to Western Electric Company. Filed September 5,

1908. In combination with an energizing spool provided with a core having a slotted projection, are an armature mounted at the side of the projection, and a contact terminal extending through the slot in the projection in position to be closed by the actuation of the armature.

929,332. ELECTRODE-SUPPORT FOR FLAMING-ARC LAMPS. Ralph Scott, Newark, N. J., assignor to Scott Electrical Company. Filed July 27, 1907. A stop for an electrode of an arc lamp comprises a button of substantially equal parts zinc and aluminum.

929,336. REFLECTOR AND LAMP-RECEIVING SOCKET THEREFOR. William H. Spencer, Brooklyn, N. Y., assignor to George Frink Spencer, Newark, N. J. Filed May 19, 1908. A reflector comprising a main reflector-body is provided witn a trough-shaped portion forming a receiving member for the reception of electric wires.

929,338. CURRENT-CONTROLLING MECHANISM FOR RAILWAY-MOTORS. Arthur B. Stitzer, Philadelphia, Pa. Filed February 18, 1909. In combination with a set of motors and a controller, is an electric circuit in which the armature and field of a motor are normally arranged in series and in which the motors are normally arranged in a loop to permit their operation in parallel, and means controlled by the controller are provided to open and close the circuit at a point in the loop including the several motors.

929,339. CURRENT-CONTROLLING MECHANISM FOR RAILWAY-MOTORS. Arthur B. Stitzer, Philadelphia, Pa. Filed February 18, 1909. The motors are normally arranged in parallel, and means exterior to, and controlled by. the controller open and close the circuit at a point in the circuit including the several motors.

929,349. WIRELESS TELEGRAPH SYSTEM. Charles R. Underhill, Providence, R. I., assignor to Underhill Telegraph Translator Company. Filed August 10, 1904. A local circuit is controlled by relay (actuated by electric wave signals) and embodies a low-resistance circuit-controlling winding, and a second local circuit controlled by the first local circuit comprises receiving means only, the latter including low-resistance circuit-controlling contacts and one or more translating devices with low-resistance winding.

929,353. INTERRUPTER. Reinhold H. Wappler, New York, N. Y., assignor to Wappler Electric Controller Company, New York, N. Y. Filed December 9, 1907. An interrupter for electric circuits adapted for use in alternate-current service comprises separable contacts at which an electric circuit may be made and broken, a magnet coil, a rectifier, and means actuated by the varying magnetic flux when at its maximum for actuating the separable contacts to make and break an electric circuit thereat.

929,354. GAS CHAMBER FOR ARC LAMPS. Ernest P. Warner and Carl Wiler, Chicago, Ill., assignors to Western Electric Company. Filed September 12, 1906. The gas cap comprises two concentrically arranged cup-shaped members having alined openings in their bottoms.

929,363. ELECTRIC SIGNAL FOR RAILWAY SWITCHES. Frank Zele, Cleveland, Ohio. Filed March 8, 1909. Circuit-closing mechanism for a railway signal comprises a contact member carried by a bell crank, which is engaged with a pivoted lever, and a slide connected with a railway switch has a cam channel and a link engaged at one end with the lever and having a roller at the other end in the channel.

929,371. ASYMMETRIC CELL. William C. Arsem, Schenectady, N. Y., assignor to General Electric Company. Filed March 18, 1908. Has electrodes, at least one of which will form an insoluble film having a chemical radical in common with the electrolyte.

929,386. TOOL OR MACHINE FOR MAKING STORAGE-BATTERY GRIDS. Rufus N. Chamberlain, Depew, N. Y., assignor to Gould Storage Battery Company. Filed January 5, 1906. Describes a cutting, spinning or rolling tool for the forming of lead storage-battery grids of large capacity from flat blanks.

929,393. RELAY. Fred B. Corey, Schenectady, N. Y., assignor to General Electric Company. Filed March 20, 1909. A metallic contact piece normally resting freely on the surface of a non-fusible contact block in electric contact therewith has a shank relatively movable into and out of engagement with the contact piece.

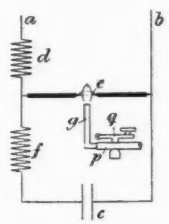
929,404. TELEPHONE ATTACHMENT. Benjamin E. Detrick, New Albany, Ind. Filed February 14, 1908. A wire bracket has means for holding it in fixed position and is provided with a laterally-extending coil, and a wire frame has seats for retaining the receiver of the telephone and passing through the coil of the bracket.

929,458. AUTOMATIC SIGNAL AND STOPPING DEVICE FOR RAILROAD TRAINS. Frank J. Miller, Cincinnati, Ohio, assignor of one-fourth to Edward A. Brockmann, Cincinnati, Ohio. Filed July 10, 1908. An electromagnet is located in the roadbed; an armature with trip devices is carried on the car and controls two terminal contacts; a throttle-valve lever is provided with a pivoted retaining pawl having a movable pin arranged to engage a rack member for locking the throttle lever, and an electromagnet is also carried by the lever and arranged when actuated by the closure of the terminals to withdraw the pin and to release the throttle lever.

929,463. ELECTRIC-LAMP SOCKET. James McGavin, Springfield, Ill. Filed December 14, 1907. Describes a ball-and-socket connection for electric lamps.

929,469. ELECTROLYTIC CELL. John McPhail, Carteret, N. J., assignor of one-third to William J. Burke and one-third to Harry R. Nelson, Carteret, N. J. Filed February 5, 1909. An inner vessel mounted within a containing vessel is provided with portions abutting against projecting portions of the containing vessel.

929,487. WIRELESS SIGNALING SYSTEM. Valdemar Poulsen, Copenhagen, Denmark. Filed December 24, 1906. Renewed May 25, 1908. An apparatus for the wireless transmission of signals comprises a circuit including an arc, means for



929,487.—WIRELESS SIGNALING SYSTEM.

supplying an atmosphere containing hydrogen to the arc, and means for varying such supply according to the signals to be transmitted.

929,492. COLLECTOR BRUSH. Henry G. Reist and Jakob E. Noeggerath, Schenectady, N. Y., assignors to General Electric Company. Filed July 28, 1904. Comprises a box having an arc-shaped slot of greater radius than that of the collector surface, and a number of flexible conducting leaves contained in the slot, the ends of the leaves entering the slot being bent to form a compact mass.

929,506. FUSE BOX. Earl Sherwood, Honesdale, Pa. Filed May 18, 1908. A fuse holder comprises means for engaging the conductor, a pin is provided to hold one end of the fuse, and a flange for engaging a portion of the fuse adjacent to that portion engaged by the pin or stud.

929,517. METHOD OF TREATING ALUMINUM ORES. Frank J. Tone, Niagara Falls, N. Y., assignor to the Carborundum Company. Filed March 3, 1909. The process consists of making a mixture of aluminum silicate, emery and carbon, the amount of carbon being sufficient to reduce the silica and all compounds in the mixture except alumina, but insufficient to reduce the alumina, interposing this mixture as a resistance conductor between electrodes, passing current through the same sufficient to fuse the alumina and reduce the other constituents to metallic form and keeping the temperature of the charge below the reduction temperature of alumina.

929,518. PROCESS OF TREATING ALUMINUM-SILICATE ORES. Frank J. Tone, Niagara Falls, N. Y., assignor to the Carborundum Company. Filed May 4, 1909. The method consists in subjecting a charge of aluminum silicate, base metalliferous material, and carbon, to electrically developed heat, partially reducing the silica, adding further metalliferous material, and completing the reduction of silica.

929,525. RELAY. Jean F. Webb, Jr., Denver, Colo., assignor to the Electric Signagraph and Semaphore Company. Filed May 12, 1908. Comprises an armature and an operating magnet therefor, a stepped block secured to the armature and a keeper co-operating with the block to lock the armature in its various positions, and a pair of fixed contacts co-operating with the armature whereby when the armature is in one position the fixed contacts will be electrically connected.

929,528. CABLE-THREADING HEAD. Frederick S. Woodward, Brooklyn, N. Y., assignor to General Electric Company. Filed May 24, 1905. A cable-threading head for a multi-conductor

cable has a number of tapered openings, and means for securing each individual conductor in an opening at an angle with the cable.

929,531. DEVICE FOR CONVERTING ORDINARY CLOCKS INTO CLOCKS WITH ELECTRIC DRIVING MEANS. August Anders, Charlottenburg, Germany. Filed June 19, 1908. Pawl holders and pawls are connected with the gear trains of the clock and adjustable rods connect independent driving levers (controlled by an electromagnetic device) with the pawl-holders and pawls, whereby the gear trains of the clock are operated.

929,543. INSULATING APPLIANCE. William A. Bonnell, Brooklyn, N. Y. Filed May 3, 1906. A combination coupling and bushing comprises a two-part sleeve and a nipple, one part of the sleeve being connected to the nipple, one part of the sleeve being provided internally with longitudinal ridges, and the other part of the sleeve being provided internally with transverse ridges.

929,578. TREATING METAL FILAMENTS. Karl T. Fuller, Schenectady, N. Y., assignor to General Electric Company. Filed August 24, 1907. The method of finishing tungsten filaments consisting essentially of material obtained by reduction of tungsten trioxide with hydrogen, consists in firing a number of the filaments in a furnace under protection of hydrogen and a carbon-absorbing means.

929,582. ELECTRIC-CURRENT RECTIFIER. Eugene Garretson, Buffalo, N. Y., assignor of three thirty-seconds to William P. Mashinter, three thirty-seconds to Clarence S. Sidway, three thirty-seconds to James D. Robertson and three thirty-seconds to William E. Robertson, Buffalo, N. Y. Filed September 10, 1908. Comprises a body of silver sulphide and a body of metallic oxide in electrical contact therewith.

929,587. ELECTRIC LOCOMOTIVE. Max R. Hanna, Schenectady, N. Y., assignor to General Electric Company. Filed September 11, 1906. A motor truck is swiveled beneath the vehicle body, a conduit extends from the truck motor through the pivot of the truck, and means are provided for creating a circulation of cooling fluid through the conduit.

929,591. BLOCK-SIGNAL SYSTEM. Laurence A. Hawkins, Schenectady, N. Y., assignor to General Electric Company. Filed September 21, 1906. Renewed October 17, 1908. Each of a number of parallel tracks has one rail conductively continuous for all currents and the other sectioned to form signal blocks, and connections conductive for all currents between rail sections of different tracks are arranged to form with the sections a continuous conductor for power-current independent of the continuous rails.

929,602. TRANSMITTER FOR ELECTRIC TELEGRAPHS AND THE LIKE. Charles L. Krum, Chicago, Ill., assignor to Morkrum Company, Chicago, Ill. Filed April 11, 1904. Comprises a set of relays, means for operating the relays in order, means controlled by the relays for imparting a succession of impulses to the line at each operation of the set, and a series of controlling keys for modifying the imparted impulses.

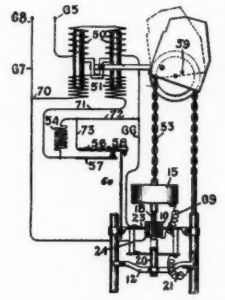
929,603. TRANSMITTER FOR AUTOMATIC TELEGRAPHS. Charles L. Krum, Chicago, Ill., assignor to Morkrum Company. Filed August 31, 1906. Has a keyboard, the keys of which operate type, each type being arranged to operate simultaneously a particular combination of switches.

929,607. INDUCTION COIL. Burton L. Lawton, Meriden, Conn., assignor to the Connecticut Telephone and Electric Company, Meriden, Conn. Filed January 12, 1909. A number of separate coil sections have sheets of insulating material interposed between the separate layers, forming partition walls, the inner terminal of one of the sections being led out through the corresponding partition wall and united to the outer terminal of the adjacent section.

929,609. ELECTRIC-CIRCUIT CONTROLLER. Harry W. Leonard, Bronxville, N. Y. Original application filed June 1, 1903. Divided and this application filed November 7, 1907. In combination with a switch is a mechanical device for holding it in a definite position, also an electromagnetic device having a movable part held by the electromagnetic device against the action of a force tending to move it whereby, when the magnetism of the electromagnetic device falls below a certain strength, the movable part will move under the action of the force and deliver a blow and cause the release of the mechanical holding device.

929,629. COIN BOX FOR TELEPHONES. Frank D. Powell, Chicago, Ill., assignor to American Coin Register Company. Filed November 18, 1908. Comprises a closed receptacle with a coin chute, a coin-registering mechanism having an actuating element interposed in the path of the coin to temporarily arrest its passage, and means in position to be moved by the coin when the latter is introduced to the coin-chute for engaging and actuating a previously inserted coin to move it past the arresting means and actuate the latter.

929,635. ELECTRIC SWITCH. Nathan H. Suren, Needham, Mass., assignor to the Gamewell Fire Alarm Telegraph Company, New York, N. Y. Filed May 23, 1908. A switch-arm consists of a hand-lever having overturned edges, and a contact plate has an integrally formed ear which enters the space between the overturned edges of the lever.



929,643.—ARC LAMP.

929,643. ARC LAMP. Johannes Härdén, Schenectady, N. Y., assignor to General Electric Company. Filed December 26, 1903. Comprises a main positive electrode formed of copper, a negative main electrode containing titanium, an auxiliary electrode formed of carbon, and means for starting the arc between the carbon electrode and the electrode containing titanium and for thereafter maintaining the arc between the two main electrodes.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired August 9, 1909:

480,266. SECONDARY-BATTERY PLATE. Edward R. Knowles, Brooklyn, N. Y.

480,284. INCANDESCENT ELECTRIC LAMP. Paul Scharf, Vienna, Austria-Hungary.

480,369. TIME CUT-OUT FOR ELECTRIC SERVICE SYSTEMS. Samuel R. Linville, Philadelphia, Pa.

480,372. SYSTEM OF ELECTRIC LIGHTING. George F. Myers, Pittsburg, Pa.

480,375. ELECTRIC-LIGHTING SYSTEM. Charles Selden, Baltimore, Md.

480,384. GALVANIC BATTERY. Herbert H. Dow, Midland, Mich.

480,392. METHOD OF ELECTRIC SOLDERING. Elihu Thomson, Lynn, Mass.

480,393. METHOD OF ELECTRICAL REGULATION. Henry E. Vineing, Roseville, N. J.

480,409. CLOSE CONDUIT FOR ELECTRIC RAILWAYS. Alexander L. Lineff, London, England.

480,475. TELEGRAPH-KEY. Alfred E. McClaren, Joplin, Mo.

480,491. ELECTROLYTIC CELL. Elisha B. Cutten, New York, N. Y.

480,492 and 480,493. METHOD OF ELECTROLYTICALLY PRODUCING POTASSIUM CHLORATE. Elisha B. Cutten, New York, N. Y.

480,539. SUPPORT FOR ELECTRIC ARC LAMPS. Augustus Wright, Providence, R. I.

480,567. DUPLEX TELEGRAPH. Thomas A. Edison, Newark, N. J.

480,575. ELECTRIC ACCUMULATOR. Giovanni Gandini, Lodi, Italy.

480,576. METHOD OF AND APPARATUS FOR TESTING CIRCUITS FOR ELECTRIC TIME SYSTEMS. William F. Gardner, Washington, D. C.

480,577. CLOCK-SYNCHRONIZING DEVICE AND SYSTEM. William F. Gardner, Washington, D. C.

480,656. TELEPHONE. James A. Christy, San Francisco, Cal.

480,683. ELECTRIC PUSH. John F. Wollensak, Chicago, Ill.

480,689. AUTOMATIC CIRCUIT-CLOSER FOR TELEGRAPH-KEYS. Charles W. Bradford, Clinton, Me.